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FOOD MANUFACTURE

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CONTENTS

	Page
Editorial	**133**
Infra-red Rays in Fish Canning	**137**
Vegetable Oils and Oilseeds	**138**
Meat and its Products	**139**
Dehydrofrozen Apples	**141**
New Chemicals from Seaweed	**142**
The Vitamins *F. A. Robinson, M.Sc. (Tech.), LL.B., F.R.I.C.*	**143**
Standards for Cream	**149**
Vegetable *versus* **Animal Foods**	**152**
The Electrical Properties of Food at High Frequencies *A. J. Ede, M.A., B.Sc., A.Inst.P., and R. R. Haddow*	**156**
Pectin in Jam and Jelly Standardisation *C. S. Priest and B. J. Setori*	**161**
Trade News	**163**
Information and Advice	**173**
Recent Patents, Trade Marks, and New Companies	**174**

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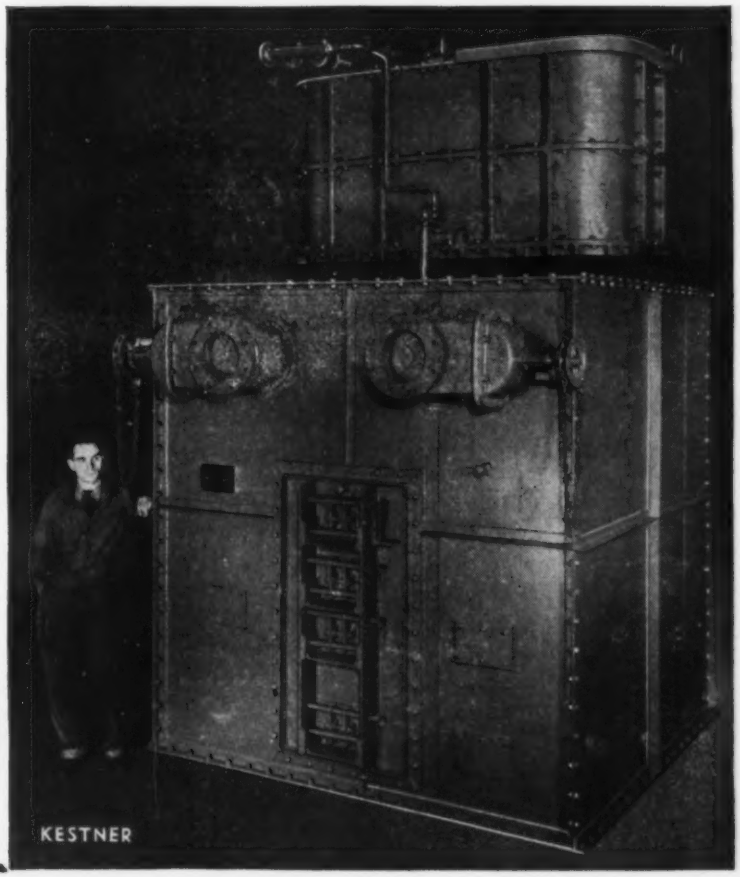

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FOOD MANUFACTURE

Vol. XXVI, No. 4 April 1, 1951

Metal and Food

THERE is little doubt that the food processing industry will be hard hit by the metal shortage. The principal metals affected will be aluminium, copper, tin, zinc, and nickel; the nickel shortage is especially serious from the point of view of the manufacturers of its alloys. Molybdenum, a small but very important constituent of the more corrosion-resistant stainless steels, is another metal of strategic importance which will be affected.

Stainless steel, which is now widely used for all contact surfaces, has also tended to be employed for external purposes. Such use must now be limited, and it is incumbent upon manufacturers to avoid waste of this valuable material, and to users not to press their demands for unnecessary "frills." For example, painted mild steel could replace stainless steel as a covering for large insulated storage tanks. It is necessary, however, to keep a sense of proportion; there are cases where a comparatively small amount of stainless steel as a covering is desirable from the point of view of hygiene.

No reliable or economical substitute exists for zinc, which is largely used as a protection for mild steel against water and detergents. Careful examination must be made to see how the use of the metal can be reduced to a safe and reasonable limit.

The upward trend of prices continues unabated, the cost of secondary metals being greater than that of virgin metals, owing to shortage of scrap. The overall shortages will undoubtedly lead to still higher costs accentuated by falling production because of lower raw material intakes.

Citric Acid in the U.S.A.

In the past twenty years the amount of American citric acid produced by sugar fermentation has risen from 10 to 35 million pounds a year, in addition to which some 2 or 3 million pounds are obtained annually from citrus fruit wastes, using the traditional process. Nevertheless, the demand for the acid continues to grow. It is still used principally in the food and beverage industry, but its growing medicinal and other industrial uses are not insignificant.

Well over 90 per cent. of the U.S. production is based upon the original tray fermentation method. This involves filling and emptying many hundreds of small trays, and the trays themselves represent a big and rapidly depreciating capital charge. It is not surprising, therefore, to learn that the deep fermentation methods developed for antibiotic production (*e.g.* penicillin) are being tried out in this particular production.

The principal problem is to keep the organism, *Aspergillus niger*, liberally supplied with air; for deep fermentation, air is constantly bubbled through the molasses-sugar solution. Pilot experiments with deep fermentation were successful, but in these pure sugar solutions were used; the conversion efficiency was hopelessly low when the normal solutions based upon waste molasses were used.

These difficulties are now said to have been overcome. With new manufacturers using the deep fermentation method and with expansions in the tray fermentation output, it is estimated that annual production of citric acid in America may rise to 50 million pounds by the end of 1951. Even so, it is not anticipated that the market will be flooded.

The Freezing of Kippers

A new method of freezing kippers in compact blocks has recently been developed by the Torry Research Station of the Department of Scientific and Industrial Research.

Kippers are usually packed in boxes of one or two stone, and then frozen in a cold store. The rate of freezing, however, may be so slow that the fish start to decompose before they are completely frozen. Some smoked white fish fillets in single one stone boxes took as long as six days to cool to 17° F. in a cold store held at 14° F. Freezing kippers in one stone boxes would take longer, and if the boxes were closely stacked, the freezing rate would be slower still.

It is impossible to quick freeze kippers in one stone wooden boxes by any of the accepted methods using normal evaporating temperatures. Commercial attempts at providing a special pack to enable quick freezing to be carried out had failed because they were based on the traditional method of packing kippers in pairs, and because the oiliness and springiness of the fish prevented them from sticking together in a compact block.

The successful Torry method was developed on the lines of the application of pressure. The experi-

ments proved that packs based on a pair of kippers as a unit always had large air pockets inside and uneven surfaces outside which made poor contact with the pressure plates. Packs of overlapping single kippers produced compact blocks with practically no air pockets and over 90 per cent. of the possible area of contact with the plates. The kippers are laid back downwards so that the thin side of one overlaps the thick side of the previous one. A two-layer pack gives a 7 lb. block about 1½ in. thick when frozen; further layers can be built up in the same way. The blocks will stand up to normal trade handling and the method is already in use.

These compact and regularly shaped blocks save about 30 per cent. of storage space compared to the packs of sharp-frozen kippers, and they can be packed in cardboard cartons instead of wooden boxes—important advantages to the growing export trade in kippers. The lack of air pockets reduces the risk of rancidity developing in cold storage, and cold storage desiccation is also reduced.

The Tinplate Shortage

When the House went into Committee of Supply on the Civil Estimates, the debate clearly demonstrated that the demand for tinplate far exceeded the supply, and that the interests of the home food market, the export market, and the Services, were in direct conflict.

In 1949, British production of tinplate was 664,000 tons, of which exports totalled more than 194,000 tons. In 1950, production rose to 690,000 tons and exports to 247,000 tons. Thus the home market got a smaller allocation of tinplate on a higher production, and several factories had had to close down temporarily. A Government spokesman said that the steel sheet and tinplate shortage was a serious factor in British post-war economy. The iron and steel development plan included the building of a modern steel strip mill at Trostre in South Wales, which was due to come into operation in the late summer; that mill would probably not produce more than about 40,000 tons this year, but the continuous strip mill at Ebbw Vale ought to produce 200,000 tons, and from the handmills could be expected about 520,000 tons, making a total of 760,000 tons in 1951.

In the calendar year 1952, presupposing no change at Ebbw Vale, total production should be 950,000 tons, with Trostre producing 250,000 tons and the handmills about 500,000 tons. From 1953 onwards, with the Trostre mill in full production, and provided supplies from the handmills could be maintained, total production should be substantially over one million tons. Of this total, 400,000 tons would be for home food packing requirements, 200,000 tons for home requirements other than food packing, and about 400,000 tons for export.

During the debate the main complaints related to exports of tinplate to different countries; for instance, one Member complained about the amount of tinplate which had been exported to Norway, from which country the Ministry of Food had bought large quantities of sprats and brisling. These products had been advertised by the Ministry, and the home canners felt that this had been done in order to encourage the sale of goods in direct competition with home-canned fish!

In his reply, the Minister of Food assured the Committee that exports to certain countries, including Argentina, had been cut, and that the amount of tinplate available for the home food industry this year would not be less than it was last year; he also said that military stock-piling of food was not likely to result in a reduction of supplies of canned food for home consumption.

It will be a serious matter if these assertions are not substantiated; in the words of Mr. J. C. Cadbury of British Canners, Ltd., in a recent letter to *The Times*, "it can be taken that for every ton of tinplate denied to the canners, they in turn will be prevented from purchasing approximately three tons of fruit and vegetables, which means in other words that 30,000 tons less fruit and vegetables can be canned in this country for every 10,000 tons of tinplate exported."

Chemicals in Food

In the March issue of FOOD MANUFACTURE, reference was made to the attention being given in the United States to the matter of the addition of chemicals to foods. That British food chemists are equally alive to the importance of this matter is demonstrated by the fact that a three-day conference on "Chemicals in Food" is to be held under the auspices of the Food Group jointly with the Agriculture and Fine Chemicals Group of the Society of Chemical Industry from September 26 to 28, 1951.

In the meantime, the subject has by no means been ignored, Prof. A. C. Frazer having read a paper at a joint meeting of the Food Group and Fine Chemicals Group of the Society which has now been published in the *Journal of the Science of Food and Agriculture*. In his paper, Prof. Frazer pointed out that the addition of synthetic chemicals to food was on the increase. These included a wide range of emulsifying agents, anti-staling and anti-mould agents, colouring materials, antioxidants, and improvers, and a further group of materials introduced to overcome shortages of fats or sugar.

Dealing with the dangers of toxic effects, Prof. Frazer said it was possible for the ingestion of a chemical substance to produce such effects; they may be acute, occurring soon after ingestion, or only after long-continued administration. Materials

introduced into food may be eaten in varying quantities by all sorts of people; they may be taken for a whole life-span, and may be subjected to various processes of cooking or mixed with other materials which alter their degree of absorption.

Assuring his audience that there was no cause for undue alarm, Prof. Frazer said that, while it was not suggested that carcinogenic materials were being used at present in the food industry, the possibility of this type of toxic effect being produced—not only by the substance itself but also by its derivatives—should never be forgotten.

Quite apart from gross toxic effects, it is necessary to determine whether the material introduced into the food modifies its nutritional value. It may do this more or less directly. For example, a substance of low nutritional value such as paraffin, or of poor assimilability such as high-melting-point fatty-acid esters or polymerised oil, may be substituted for normal fats which are readily absorbed and have a high caloric value. Further, the added chemical may interfere with the action of alimentary enzymes or with the absorption of material of nutritional value.

As important as direct interference with nutritional properties of the diet is the possibility of the added chemical substances causing changes in gastro-intestinal function which may produce profound nutritional disorder in spite of the consumption of a nutritionally adequate diet.

The only way in which the health of the nation can properly be safeguarded is for a thorough study of the effects to be made with each material introduced. Methods are available for many of these investigations and others must be developed. Prof. Frazer went on to discuss the limitations of the methods available and the value of the information which they provide.

Speaking of toxicity tests, he sounded the warning that these were only a relatively crude method of study and do not alone represent an adequate safeguard against possible dangers to health arising from the inclusion of synthetic chemicals in food. It was therefore necessary to improve the sensitivity of such tests if possible, and to carry out more detailed studies of the absorption and metabolism of the substance in question.

Even if full toxicity tests have been carried out and the absorption and metabolism of the substance have been thoroughly studied, the picture is still incomplete until a full examination of the possible effects of the substance on normal gastro-intestinal functions has been made. Fuller knowledge and understanding of gastro-intestinal functions as a whole, and better methods for the accurate measurement of these functions, are badly needed.

Prof. Frazer concluded by saying that University laboratories, which are primarily concerned with fundamental work, must lead the way. They must be given every opportunity to provide the essential foundation upon which the more applied studies of the industrial or the toxicological laboratory can be based.

It will be seen that the whole subject calls for long-term study; perhaps Dr. McCay, the Cornell University nutritionist, did not exaggerate when he said that the preliminary investigations might occupy ten years or more.

The World Food Outlook

The ever-increasing political tension throughout the world is bringing about almost kaleidoscopic changes in the outlook for food and agriculture. Judging from a survey of world agriculture in 1950, recently issued by FAO, it appears that, in 1951, world food supplies are likely to be only slightly greater in quantity and nutritive value than in 1950. Moreover, gains are likely to be least in evidence where improvements are most urgently needed, while taken as a whole the increases, even if they could be made freely available, would hardly suffice to keep pace with the demands arising from population growth.

Of late years, the outstanding feature has been the steeply rising prices of world commodities, and there appears to be nothing in the present situation which warrants the hope that this will not continue. The urgent need is for still further increased production, but continually rising prices must inevitably stimulate sales resistance in consuming centres. Against this must be set the overriding urgency of demands for raw material for military stock-piling. We have seen in consequence rocketing prices for many staples: cotton, wool, and rubber are cases in point.

In commenting upon this situation, the writer of a leader in the March 1951 issue of *World Crops* points out that it is easy to condemn this tendency, and that it must be realised that several years must elapse before plans for increasing output can attain fruition. Especially is this so with animal products and with crops derived from permanent cultivation. It is unreasonable to expect expansion of production without some sort of guarantee that there will be a reasonably satisfactory return when the produce comes to market. In such circumstances (the writer asks) who can blame producers for pitching their demands at ever-increasing levels? It is suggested, however, that such a condition of affairs is most dangerous since, while conflicting views challenge one another, settlements are impossible and consumers go without. The present meat crisis in the United Kingdom is an example.

The writer stresses that some solution must be found if the future is to hold any prospect of security.

The inflationary spiral of rising costs and prices must be checked and means found which will ensure adequate safeguards to producers and consumers alike, and provide the economic stability essential to prosperity. He doubts whether this can be achieved within the existing framework of world economy. It may be that a solution could be found in a system of national and international price guarantees or in a series of interlinked commodity exchange arrangements. The first step in the right direction is agreement as to the need for a modified system and a willingness to discuss possible alternatives, and it is hoped that in due time the discussions and studies being undertaken by UNO and FAO may provide a basis for it.

In any event, the greatest hope of ultimate success would seem to reside in overall international arrangements taking a wide range of related commodities within their scope, rather than in separate bilateral or trilateral agreements relating to single products.

Synthetic Flavours

One of the consequences of the Korean war and the general uncertainty about stability in the Far East is a greatly intensified interest in synthetic flavours for manufactured foods. The second World War stimulated the trend towards concentrated extracts and chemical substitutes, and any post-war tendency to revert to the older known natural spices or essential oils received a cold shower of discouragement with the first crossing of the 38th Parallel.

For example, there is the shortage of pepper as a challenge to technologists. In America it has been accepted. Six pounds of the flavour-carrying factor in black pepper—oleoresin—can be extracted by treating 100 pounds of pepper with solvents. It is very much easier to store six pounds than 100 pounds. Furthermore, when the six pounds of oleoresin are spread on a carrier such as ordinary salt, the flavouring effect of the "artificial pepper" is equivalent to that of 200 pounds of the original whole pepper. For uses in food manufacture, pepper can be made to go twice as far by this relatively simple processing treatment. Advances of this kind, brought into existence through war emergency, often have economic effects that last much longer than their parent circumstances.

China's long story of war and civil war has lost her much of the monopoly market for oil of cassia. Although the Chinese oil contains the exceptionally high content of 85 per cent. of cinnamic aldehyde, users of this product had experimented with Ceylon cinnamon during the war between China and Japan. The Ceylon product contains only some 25 per cent. of cinnamic aldehyde, but when Chinese supplies were unobtainable it was found that synthetic cinnamic aldehyde could be added to the inferior material from Ceylon, thus bolstering up its flavouring power to a reasonable equivalence to true oil of cassia. Today American users are again turning to Ceylon for their supplies of natural cinnamon oil, and to the synthetic chemicals industry for the necessary additive material.

During the last war opportunities for synthetics in this field could not be grasped. The markets were wide open, but it was not possible to build the plant to make synthetics even when effective processes were available. A number of synthetic essential oil plants have been brought into existence since the end of World War II. To that extent, at any rate in America, new uncertainties in the Far East are presenting real opportunities for the manufacturers of chemical flavouring agents and the extending agents for natural materials.

Wool Threatens Food Supply

British food arrangements are based upon the assumption that Australia and New Zealand will send dairy produce and increasing amounts of meat to the U.K. The past pattern of this trade in dairy products is so well established that no one suspects it might not continue, and hopes that production of meat for export to Britain can be steadily expanded seem a good deal firmer than the hopes that planners once entertained about groundnuts, and eggs from Gambia.

Nevertheless, big changes are taking place in the agricultural policy of Antipodean farmers. Dairy herds are being sold up throughout Australia for the simple reason that it is both easier and more profitable to produce meat and wool. Some practical Australians believe that instead of *exporting* butter Australia will be *importing* dairy produce within a few years!

In New Zealand the wool boom has driven dairy herds from many miles of traditional milk-producing pastures; dairy bulls have been almost impossible to sell. Sheep are rapidly replacing cows, and, as long as the wool boom lasts, they will be kept alive to produce annual crops of wool rather than be killed for meat.

These great alterations in the pattern of private farming are likely to offset any of the benefits to be derived from Government-sponsored plans to produce meat in the Northern Territory. Any increase in British imports of meat from Australia or New Zealand will probably consist of meat from low-grade dairy cattle, and even this will be only a short-term increase. Coupled with this is the possibility that dairy produce imports may fall sharply. The 1950/51 wool boom may be a cause for regret for years to come; when most of the world is short of food a diversion of traditional food-producing land to fibre production is surely undesirable.

Infra-red Rays in Fish Canning

A new German mechanical fish canning process, known as the infra-red ray blanching method, has been developed, and special plant for this purpose, supplied by Lubecawerke G.m.b.H., of Lübeck, is now in operation at one of the canning factories of the Nordsee Fischereien, A.G., Bremerhaven, Germany.

THE German fish industrialist Karl Hartmann, in collaboration with physicist Dr. Maercks, has evolved a continuous blanching process using the principle of infra-red light radiation. The principle applied was in accordance with the ray depth effect of the arc ray receiver used in medicine. The rays of the invisible spectrum call for a process which cooks from the inside towards the outside rather than the reverse. During the process, part of the water in the tissues of the fish is set free and is then removed by mechanical means.

Characteristics of the Process

The special characteristic of infra-red heating is the development of heat on the surface of the fish which soon produces a firm, dry skin. The heat generated in the outer layer is conducted into the parts of the fish not directly affected by the radiation; these are likewise brought up to the necessary temperature, the water content of the cells is freed, and at the same time the albumen is coagulated. Since the heat is generated in a relatively concentrated layer, its intensity may be increased above that normally possible by heat conduction methods. The thermal efficiency of this type of infra-red plant is considerably higher than that of steam or hot air plant.

Processing Operations

The sequence of operations in the canning of sardines, sprats, brisling, and herring is the washing, cleaning, scaling, and pickling, drying of the raw fish, and its packing into containers which are lined up on flat tin boxes and placed in the receiver of the apparatus, through which the containers move by means of a chain belt.

The cans first pass through the light bath zone, where the heating of their contents takes place. During this process, part of the water content of the fish cells separates and collects at the bottom of the can. As soon as the containers have passed through the heat zone, the final temperature being approximately 170° C., the chain belt makes one rotation which tips the water from the cans into a trough. This tipping process is to be modified so that the water is removed centrifugally.

At the end of the chain belt the boxes containing the cans are removed and arranged laterally on another belt where they are automatically filled with oil at 70° C. The cans are then sealed and sterilised.

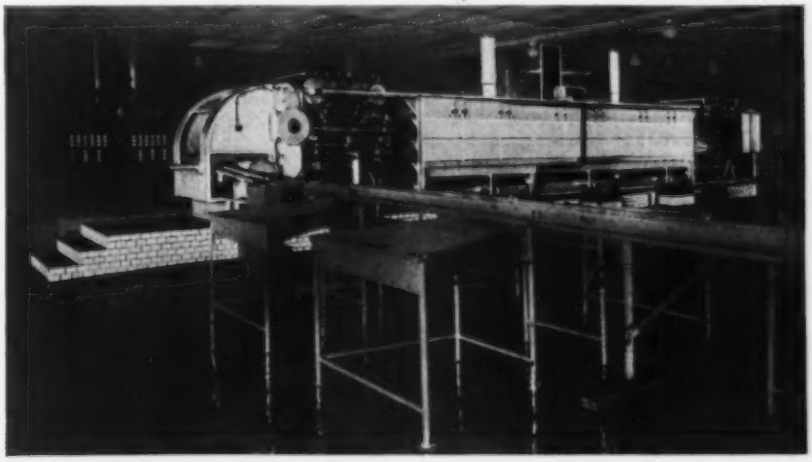
Capacity of the Plant

The LW 1000 Hartensator, developed by the Lubecawerke Company, is a high-power plant for the treatment of fish in all shapes of cans. The capacity of the standard model depends on the size of the can, *e.g.* 4,400 cans measuring 88 × 63 mm. or 2,300 measuring 168 × 115 mm. may be handled in one hour. Where 3,000 cans measuring 148 × 81 mm. are treated per hour, it is claimed by the manufacturers that there is a 60 per cent. saving in wages owing to the automatic operation and economy of the equipment. The saving on the overall cost of production varies according to the number of cans produced, *e.g.* a saving of 61·4 per cent. is claimed with an output of 9 million cans per annum, and 37·8 per cent. with an output of 3 million.

Recovery of Fish Oil

The percentage of fish oil recovered depends on the type and quality of fish, *e.g.* 3 million cans, each containing 200 g. of cut fish, are equivalent to 600,000 kg. of fish; a return of 2 per cent. obtained with this plant is equal to 12,000 kg. of fish oil, which can be put back into the finished product.

In general a thickener is added to the sauce to obtain the desired consistency. The more expensive thickening agents, such as agar agar, can be replaced by the strongly albuminous solution separated out from the fish, which amounts to at least 10 per cent. by weight of the raw fish. The treatment of fish has already shown that a good thickening agent can be obtained from this fish water without incurring much expenditure.



The LW 1000 Hartensator.

The finished product is of excellent quality, and because of the infra-red penetration the skin is not damaged in any way and the fish do not disintegrate. In the processing of herring by this method, only very small traces of water remain in the oil and these are completely absorbed by the herring during storage, flavour and aroma being similar to that of sardines.

Advantages of Infra-red Method

The advantages of this method of processing are many and its field of application wide. It is in no way limited to the production of preserved food in oil, although, as indicated, one of its advantages over the conventional method is the removal of the water content, which leaves a pure oil filling.

The infra-red method has proved economical, rapid, labour-saving, hygienic, and safe. The accurately controlled conditions and low temperatures obtained by the equipment produce the desired transformation of albumen in a short time and avoid vaporising the fish juices which are thereby liberated. The need to produce energy for vaporisation, which all known installations have required up to now, is eliminated by the use of this equipment, and this has a decisive effect upon the economic consumption of energy.

It is anticipated that further experience with mass production and lower prices for containers will result in lower cost to both the manufacturer and the consumer. The Hartmann method is protected by patents, and in the course of its further development this method is to be made available to other German fish canneries.

ACKNOWLEDGMENT.—*The material for this article was kindly supplied by E. W. Allen and Company, who are British agents for the Lubecawerke Company.*

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Vegetable Oils and Oilseeds

THE world production of vegetable, animal, and marine fats and oils which was considerably reduced during the war has since shown a marked improvement, and in 1949 it was slightly above the pre-war level. Vegetable oil production, which accounts for a large part of the total, is now substantially larger than pre-war.

Statistics published in a recent review* show that the output of the main oilseed crops, in terms of oil, amounted in 1949 to about 11 per cent. more than the 1934-38 average. The trade position, however, is less satisfactory; despite a steady increase from the low war-time level, exports of vegetable oils, including oilseeds in terms of oil, amounted in 1949 to little more than 3 million tons, some 17 per cent. less than the 1934-38 average. The relative slowness of this recovery may be attributed to disturbed conditions in the Far East, to the increased domestic requirements and expanded oilseed crushing capacity of certain exporting countries, particularly India and Argentina, and to currency difficulties in importing countries.

As to the last factor, the European Recovery Programme and other financial arrangements have made a large contribution towards the removal of shortages. Thus, a feature of 1949 was the very sharp rise in exports from the United States, where production in recent years has been much larger than pre-war.

A further important factor has been the expansion of exports from the colonial territories of Africa. The United Kingdom remains by far the largest outlet for supplies entering international trade. In 1949 it was followed in order of importance by the United States, France, Germany, and the Netherlands. Japan also received greatly increased supplies in 1949.

The Commonwealth is an important producer of all the main oilseeds, except soya bean and sunflower seed, and accounts for over one-fifth of the estimated world output. It provided nearly half the total exports in the later war years, but with supplies from foreign sources increasing, and exports from India restricted, its share of the total fell in 1946-49 to only one-third, the same proportion as before the war. India remains the largest single producer in the Commonwealth, but British West Africa is now easily the leading exporter.

In terms of oil, shipments from British West Africa rose in 1949 to approximately 546,000 tons, some 20 per cent. above the pre-war level. Exports from Ceylon, greatly reduced in 1946, rose in 1948 and 1949 to about the pre-war level, while the steady improvement in consignments from Malaya and the British Pacific Islands was continued. In Canada the output of linseed fell sharply in 1949, when the support price was withdrawn, but exports of seed and oil remained relatively heavy. Shipments from India and Pakistan in 1949, however, amounted to scarcely one-sixth of the 1934-38 average.

The tremendous post-war increase in United Kingdom imports of vegetable oils, mainly from the Commonwealth, is reflected in the total estimated supplies which, in terms of oil, amounted to some 930,000 tons in 1949, or 44 per cent. more than before the war. Supplies in the United States increased by nearly half a million tons, or 27 per cent. in the same period. Margarine production absorbed the bulk of the increased supplies in both countries.

In addition to statistics of production and trade relating to all the principal oilseeds in the years since 1938, the review contains detailed figures showing the production of soap, margarine, and compound cooking fat in the principal countries, and the utilisation of oils and fats in the manufacture of these commodities in the United Kingdom and the United States. There is a further section providing a brief survey of the production and imports of whale oil.

* *Vegetable Oils and Oilseeds.* Pp. 118+xiv. Published for the Commonwealth Economic Committee by H.M.S.O. Price 5s. net.

Meat and its Products

That luncheon meats form something like 40 per cent. of America's canned meat trade is one of a number of significant facts mentioned in the recently published report of a productivity team. This team recently visited the United States under the auspices of the Anglo-American Council on Productivity and the technical assistance provisions of the Marshall Aid plan to study the meat packaging and processing industry. In order to acquire some basis of comparison with American methods before sailing, team members from meat processing firms were permitted to inspect the plants of highly competitive British undertakings who had not hitherto opened their doors in this way. Such co-operation is widespread in America and it is hoped that this lead will be followed and maintained by other firms in the meat processing and packaging industry as well as by manufacturers engaged in other sections of the British food industry.

MEAT packing in the two countries is essentially dissimilar. In the United States it ranks as the third largest industry, and all its raw material is home-produced livestock. In 1950 the average consumption per head was expected to reach 150 lb.; nearly half of this is pork, with beef a close rival; mutton is falling out of favour, lamb and veal together representing less than 10 per cent. Judicious advertising is held accountable for increasing the consumption of meat over many other foodstuffs.

Advertising is undertaken by the American Meat Institute as one of its functions. It is a trade, research, and educational association equipped to give a very much wider form of assistance and advice than any comparable organisation in the United Kingdom. Its correspondence classes, conducted in co-operation with the University of Chicago, cover marketing of livestock, sausage and beef and pork operations, accounting, packing, plant management, and other aspects of the industry.

Wide Range of U.S. Products

The range of meat products is wide since, in so vast a country as the United States, there is great diversity of taste as between localities and even between racial communities; indeed, many products have no real counterpart in Britain. Under the name "sausage," for instance, are listed not only all the leading European varieties, but also more than a hundred American ready-to-serve specialities.

Meat packers have established nation-wide selling organisations through which they are able to gauge demand in different areas and to sell the current production to the best advantage. At branch-houses refrigeration facilities are maintained; they serve as a "cushion" between supply and demand. Incidentally, most of the meat frozen for marketing is pork; nearly all frozen beef is destined for sausage manufacture.

Slaughtering Operations

Slaughtering procedure is stated by the team to be the only aspect of the industry lending itself to direct comparison between the two countries. In that section of the report devoted to production methods are given descriptions of the methods and appliances used in killing, cleaning, recovery of by-products, and allied operations. Factory output is enormous, up to 8,000 pigs per day being handled in one large factory, where the rate per man-hour is as high as 3·58. Extreme care is taken to remove the hair from carcasses, and nearly all American packers, without regard to expense, collect animal glands to assist in furthering medical research.

Bacon and Sausages

American bacon bears little or no resemblance to bacon as it is known in Britain, being confined to rectangular-shaped bellies. It is cured or processed by a method very different from that practised in the U.K., the emphasis being on speed and uniformity. American belly bacon lends itself to pressing and high-speed slicing for marketing in small packages ready for the counters of the self-service stores. In some cases, vacuum packing in envelopes of cellulose or plastic transparent film has been introduced to improve the keeping quality of the product, but it seems doubtful if this is in fact being accomplished.

The highest proportion of the sausages produced is of the cooked Frankfurter variety. All sausages contain a very high proportion of meat, and chopping equipment in general use in Great Britain is inferior to the leading American appliances.

Meat Canning

Although the actual products of American meat canneries are unlike British ones, methods used to produce them are described in the report, since they may be applicable even although the end-products differ. The number of operatives employed on a line is judged to be similar in both cases, but the output of filled cans is appreciably higher in America. Typical speeds are 360 per minute for small sizes and 170 for 12 and 16 oz. cans. Almost all plants purchase their cans; two firms between them are stated to supply 75 per cent. of the cans used in the U.S. Meat products are packed in lacquered and unlacquered cans, there being a difference of opinion as to which is preferable on hygienic grounds. Lithographed cans are often used to obviate labelling.

Canning processes and transport between them are highly

* *Meat Packaging and Processing.* Productivity Team Report. Pp. 72+xii. Anglo-American Council on Productivity. Price 4s.

mechanised. Among ingenious devices described is a flap-counter inserted in the chute delivering pigs' tongues to packing operators. Each tongue as it passes the flap registers its passage, thereby recording the operator's output for bonus purposes. There is a tendency to include condiments and sauces within the canned meat packs for use at the customer's discretion. For the separate packing involved a sack made of plastic film is used by one manufacturer.

Meat Inspection

In Britain the Government Memorandum on Meat Inspection issued in 1922 is still a memorandum only, and has no force of law, but throughout America inspection is compulsory, very comprehensive, and organised on two scales: State and Federal. Federal inspection, which is enforced upon all products that are to be exported outside the State of origin, carries the right to brand the product "U.S. inspected and passed." About 80 per cent. of U.S. meat is passed under Federal control.

For either form of inspection the firm must provide facilities and accommodation for the inspecting staff, but the cost of the service is met from official funds, the only payment made by packers being for overtime inspection. This compares very favourably with the British practice, where the curer (or packer) if he requires full veterinary inspection usually has to bear the full cost of it, in addition to providing accommodation.

Packaging Methods

With the development in America of self-service stores, the trend in food handling has been towards the use of packaging to display the commodity as well as to protect the contents. Thus, the retailer is being relieved of the task of cutting and wrapping. The American packer still deals with carcasses on cutting lines, but a proportion of the meat is now transferred to departments where it is wrapped attractively for the retail counter.

Although this has had the advantage of making the individual packer known to his customer, it has entailed the provision of additional factory space for prepackaging, with parallel increase of overheads and more frequent deliveries of perishable commodities, such as "ready-cut joints" and "bacon slices." Such conditions are thought likely to arise in Britain only in the distant future, but if they did, it is the team's opinion that much of the extra cost would have to be met by the retailer, since it can be borne only to a small degree by the packer, and should not in all fairness be passed to the consumer.

On the subject of administration the team does not hesitate to state that there is a more exact approach to management in the American meat packing industry than in the United Kingdom. All data and information for assessing efficiency—normally made available only to management in Great Britain—are more widely distributed and put to much better use.

Comparison of Methods

The methods in use in the factories visited are in no way in advance of best British practice, but it is considered that the application and use of costing is much better. The very comprehensive cost control systems in operation have been fostered by the highly competitive conditions which obtain throughout the meat industry. The urgent need for increased productivity has done much to bring this method of assessing efficiency to the forefront.

The operatives' efforts are energetically applied to the task in hand in the belief that under efficient management their endeavours must be reflected in the successful results of the company. It is to this that the team attributes the feeling of real confidence that could be sensed between employer and employee.

Industrial Relations

In considering industrial relations, comments are passed upon the punctuality of workers in taking their mid-morning breaks and lunch periods; and upon the absence of a punitive tendency in taxation—both direct and indirect—in America compared with Britain. There at least taxation appears not to discourage anyone from working hard.

Enlarging upon the good relations between union, management, and men, the report says that the workers appeared content to see their representatives paid well and given generous expense allowances on the basis that they were responsible for successful hard bargaining on their behalf with big business. The union leaders therefore exercise considerable influence over their members and unofficial strikes appear to be non-existent.

Future of the U.K. Industry

The future prospects of the industry in Britain are reviewed in the general conclusion of the report as follows: "If management in this country can be, and is, permitted to provide conditions similar to those in American plants, then there is no reason why British workers should not achieve the production attained by their American counterparts. At the same time, having visited the American on his job, we must record our view that there is a complacency in British industry not evident in America. In order that our rates of productivity may be brought into line with those existing in America this must be replaced by a keener industrious outlook. Monetary incentives . . . may go part of the way to bringing about this change of attitude, but we feel that incentives of a different nature are required . . . and only by the combined efforts of management and workers can this be achieved."

Machinery Imports Necessary

Linked with this is a recommendation that as a matter of urgent necessity the industry should be given, as and when the financial situation permits, facilities for the importation of certain machinery. These machines, which would be required only in small numbers, would greatly increase British productivity.

Dehydrofrozen Apples

THE advantages of dehydration and freezing are combined in dehydrofreezing, a comparatively new food processing technique which has been satisfactorily applied to many apple varieties.

William F. Talburt, L. H. Walker, and Myron J. Powers, of the Western Regional Research Laboratory, Albany, California, have published a general paper (*Food Technology*, **4**, 12) covering the overall processing methods which consist of the conventional preparation of the commodity as for canning or freezing; inactivation of enzymes by heat or chemicals, if necessary; a short, rapid drying cycle in an atmospheric drier to reduce the weight and volume by at least one-half; and packaging, freezing, and storing at 0° F.

Preparation of the Apples

The apples are first peeled, cored, and sliced, and, after treatment for enzyme inactivation, go directly to the drier. Drying conditions are not critical for blanched apples so long as excessive temperatures, which may cause heat damage, are not used. A temperature of 220° F. may safely be used where the extent of dehydration does not exceed 50 per cent. of the original weight. In drying slices which have been treated with sulphur dioxide for enzyme inactivation, conditions must be carefully controlled, since the final sulphur dioxide content, which should be kept near its threshold value, is determined to a large extent by the wet and dry bulb temperatures used in drying. In addition, sulphur dioxide must penetrate to the centre of the slice before the temperature of the whole piece rises above 120° F., otherwise centre darkening will occur.

Drying Operations

Cabinet and tunnel type driers using cross-flow air with velocities of from 500 to 900 linear feet per minute have been successfully used in the partial dehydration step. Where tray drying is used, tray loadings should not exceed 1·5 to 2 lb. per sq. ft. in order to obtain more uniform drying. Continuous multiple-belt driers and certain types of rotary driers should be suitable for this operation, and should reduce labour costs considerably.

Packaging Costs and Methods

Savings in packaging costs may be accomplished by packing a greater weight of apples (fresh slice basis) into a container of a given size than is possible without dehydration, and by the use of lower cost containers, since no liquid drains from the slices even after freezing and thawing.

Packaging can be effected either before or after freezing, but for maximum economy, packaging should precede freezing, since the unfrozen slices are soft and pliable, packing closely into the container. In this state it has been found that 50 to 60 lb. (fresh slice basis) of apples can be packed into a 30 lb. can.

When frozen before packaging, about 25 per cent. fewer apples can be packed into this size of container. This latter method of packaging, although more expensive, may be desirable for certain uses where individually frozen pieces are required.

Dehydrofrozen apples, dried to 50 per cent. weight reduction, are reduced in size also by one-half, without appreciable change in the general appearance of the slices, which are not shrivelled or misshapen and do not have a dried apple appearance. They can be thawed and held at 75° F. for several days, and at 32° F. for a week or longer.

Reconstituting the Apples

The thawing period is much shorter than that for conventional frozen foods, and absence of leakage from the thawed slices is a considerable advantage to the baker. In reconstituting for pie filling, a short soaking period of about one hour is sufficient for most uses.

Results of bakery trials have shown that dehydrofrozen apples are quite satisfactory for large or small operations and are readily adaptable, with only minor changes in procedure, to any of the commercial methods employing either fresh, frozen, or canned apples.

New Books Register

Orders for any of the books listed below, or scientific and technical books in any language, may be placed with the Books Department, FOOD MANUFACTURE, *17, Stratford Place, London, W.1. A selected stock of books is carried and may be inspected at the same address. Prices given do not include postage.*

Alexander, J. *Colloid Chemistry, Theoretical and Applied*. Reinhold Publishing Corporation, New York; Chapman and Hall, London. Pp. 736. Illustrated. £6.

Anglo-American Council on Productivity. *Packaging*. London, 1950. Pp. 58 + xiii. Illustrated. 2s. 6d.

Bennett, H. (Ed.). *The Chemical Formulary*. Vol. IX. Chemical Publishing Co., New York, 1951. Pp. 648 + xvi. $7.

Bennion, E. B. *A Primer on Breadmaking*. Oxford University Press, London, 1951. Pp. 166. Illustrated. 10s. 6d.

Cameron, E. J., and Esty, J. Russell (Ed.). *Canned Foods in Human Nutrition*. National Canners' Association, Washington, 1950. Pp. 264. Illustrated.

Chapman, V. J. *Seaweeds and their Uses*. Methuen, London. Pp. 290. Illustrated. 25s.

Dixley, F. *Practical Handbook of Water Supply*. Allen and Unwin, London. Pp. 573. Illustrated. 35s.

Fischer, E. K. *Colloidal Dispersions*. John Wiley and Sons, New York; Chapman and Hall, London. Pp. 387. Illustrated. 60s.

Veal, T. H. P. *The Supply of Water*. Chapman and Hall, London. Pp. 276. 25s.

New Chemicals from Seaweed

DESIGNED and equipped primarily for the development of pilot scale processes for the production of chemicals from seaweed, the Gulland laboratory at the Institute of Seaweed Research, Inveresk Gate, opened recently by the Secretary of State for Scotland, is the first semi-technical chemical laboratory to be built in Britain at a Government aided research institute not dealing with defence problems.

Although the survey of Scotland's seaweed beds cannot be completed for some years to come, sufficient is known to state that approximately 10 million tons of brown seaweed are growing between low water mark and 7 fathoms in Scottish inshore waters. Of this quantity, probably not more than 40 per cent., *i.e.* 4 million tons, will be profitable to harvest. To conserve seaweed resources, not more than a quarter of this amount should be harvested each year, providing, at a conservative estimate, over 200,000 tons of dry brown seaweed annually if harvested at the right time of the year.

Alginate and Agar Production

The industry, which has already been built up on alginate and agar production, is at present manufacturing these chemicals to the value of about £$\frac{3}{4}$ million per annum, the collection of seaweed for which has significantly reduced the unemployment problem in the Outer and Inner Hebrides.

Scotland's proved seaweed resources have as yet barely been touched, however, and if they are to be fully utilised, other seaweed chemicals must be exploited.

Products made from Seaweed

It is now known with reasonable certainty that the 200,000 tons of dry brown seaweed potentially available each year, if collected at the right time, are capable of yielding about 30,000 tons of alginic acid, a slightly larger quantity of the principal seaweed sugar, mannitol, almost 40,000 tons of laminarin, the seaweed starch, and over 5,000 tons of a new chemical known as fucoidin.

Two of these chemicals in turn can be converted into two other sugar-like materials, glucose and the less well-known sugar fucose. There are, in addition, smaller and as yet unassessed quantities of proteins, fats, sterols, amino acids, and other chemicals.

In an attempt to provide economic outlets for these new commodities, the Association has erected and equipped the new laboratory so that these chemicals can be produced on a pilot scale. By this means it is hoped to prepare bulk samples for industrial assessment through member firms and at the same time develop economic processes for their production on a scale sufficiently large to permit an assessment of costs.

The Gulland Laboratory, a brick and steel building with 2,400 sq. ft. floor space, has been named after the late Professor J. Masson Gulland, M.A., D.Sc., F.R.S., who, until his death in 1947, was Jesse Boot Professor of Chemistry, Nottingham University. He was one of the first to visualise the need for a scientific investigation of Scotland's seaweed resources, and was largely instrumental in bringing the Research Association into being.

Microbiology for Bakery Students

A SCIENCE cannot satisfactorily be sub-divided into trades and professions. A few items concerning microbiology, chemistry, or other sciences, cannot be picked out and described as covering all that the pastrycook (or bank manager or bartender) needs to know. It would be better either to leave him in a safe state of ignorance, or to assume a moderate grounding in the subject and to concentrate on the applications.

In a recent book,* whose title prompts the above reflections, the author disarms criticism to some extent by saying that it is evident he is not a baker; in addition, he gives a readable elementary account of micro-organisms and technique. Over-simplification leads at times to rather misleading phrases, *e.g.* on p. 8 it is stated that "*p*H 4·5 would be very acid," and that alcohol formation by yeast may be followed by "further reduction of the alcohol to acetic acid" by vinegar bacteria.

Yeasts, moulds, and bacteria are dealt with in three separate chapters, that on the mould fungi being the least satisfactory. A somewhat exaggerated degree of resistance to heat, and of susceptibility to U.V. light, is attributed to moulds on p. 32; and the statement that some 200,000 species of moulds have been described is well ahead of the facts.

Chapter VI gives a brief but good account of the bacteria. A fuller account of the bacterial flora of flour and dough might be worth a place in a future edition. A chapter on the microscope contains much useful information, although the "working distance" of an objective is apparently considered a synonym for the equivalent focal length as marked on the objective.

Several chapters deal with the methods of sterilisation, the making of cultures, and the use of stains. The dilution technique, so essential for obtaining pure cultures and determining bacterial counts, is relegated to the last but one of the practical exercises suggested in an appendix. Exercise 4 is a little obscure, and seems to imply that bacteria capable of utilising citrate are necessarily autotrophic, which is not in accordance with the usual definition of an autotroph.

The few remarks on personal hygiene (p. 55) might well be amplified. The author's experience in pathology would enable him to emphasise the essentials of true *versus* bogus hygiene.

The book is illustrated with text figures and with six plates borrowed from Jörgensen's well-known textbook.—L. D. G.

* *Microbiology for Bakery and Confectionery Students.* By W. W. McEwen. Pp. 104. J. and A. Churchill, London. Price 8s. 6d.

The Vitamins

Progress in 1950

F. A. ROBINSON, M.Sc.(Tech.), LL.B., F.R.I.C

The synthesis of vitamin A announced in 1947 marked the successful conclusion of a decade's intensive work on this difficult problem carried out in many academic laboratories, but the industrial exploitation of the new discovery then seemed very remote. Yet within three years the synthetic vitamin can compete successfully with vitamin concentrates made from fish liver oils—surely one of the outstanding technological achievements of recent years.

DURING the year under review, the synthesis of β-carotene has been announced and, although there seems at the moment little reason to believe that this substance has any commercial future, it would seem unwise in the light of past experience to venture a prediction to that effect.

Important technical developments have also been made in the production of vitamin B_{12}; this is now available at a price which seems ridiculously low for a substance that was a laboratory curiosity only twelve months ago, and it appears to have become the treatment of choice for cases of uncomplicated pernicious anaemia. Much has been discovered during the year about the structure of vitamin B_{12}, which proves to be a co-ordination complex of cobalt, a type of compound not hitherto encountered among members of the vitamin B complex. Part of the molecule, however, closely resembles that of riboflavin.

For the rest, there have been no spectacular achievements to report, but further light has been thrown on the relationship between nicotinic acid and tryptophan and on the biological functions of pantothenic acid and biotin.

Vitamin A

Synthetic vitamin A and its acetate and palmitate are now commercially available in the U.S.A. at prices surprisingly close to that of the natural vitamin and its esters. Natural vitamin A can be bought at about 16 cents per million units and the synthetic vitamin at 18 cents per million units—a most remarkable achievement when the vast amount of unfruitful effort expended on the attempted synthesis of this substance before successful results were obtained in 1947 is considered.

Provided that adequate supplies of the starting material—β-ionone—can be guaranteed there would appear to be no danger of a future world shortage of vitamin A such as might conceivably have occurred through excessive exploitation of suitable fishing grounds. Three American firms are said to be in production, but the synthetic vitamin is not yet available in Great Britain.

One or two more papers[1] and a considerable number of patents[2] have been published giving further details of different stages in the synthesis of vitamin A. Reports have also appeared[3] on the preparation of several new analogues of vitamin A, such as the benzene, cyclopentenyl, and cycloheptenyl; none of these compounds has any appreciable biological activity.

A study of whale liver oil[4] has shown that the oil from the blue whale contains very little kitol, the biologically inactive "dimer" of vitamin A, whereas that from the sperm whale contains substantial amounts.

Kitol is not converted into vitamin A by rats, neither is it stored in the liver. Vitamin A esters can be separated from kitol esters by extraction with 80 per cent. aqueous alcohol, while for analytical purposes vitamin A can be freed from kitol by extracting the unsaponifiable fraction of whale liver oil with 50 per cent. alcohol. Alternatively, vitamin A can be estimated in whale liver oils by measuring the colour produced by reaction with activated glycerol dichlorhydrin; this reagent gives no colour with kitol.[5]

"Krill" from whales' stomach was found to contain little carotene, but preformed vitamin A was present in amounts equivalent to 6 i.u. per g. of stomach contents, mostly in the form of ester.[6]

The livers of fish fed plankton oil had a vitamin A content higher than the livers of fish fed carotene, and the oil appeared to contain a provitamin that was not a carotenoid.[7]

The livers of two species of seal contained 24,000 and 15,000 i.u. per g. of vitamin A respectively.[8]

A considerable amount of work

Four weeks' old cockerels bred from hens on a diet low in A.P.F. The one on the left was given no supplement, the other received a supplement of 2 μg. of vitamin B_{12} per 100 g. of diet.

Courtesy Dr. S. K. Kon and Miss M. E. Coates, National Institute for Research in Dairying.

has been carried out during the year on the relative efficiencies as sources of vitamin A of different forms of the vitamin and of carotene. Results cited in last year's review, showing that carotene is less efficient than vitamin A, have been confirmed, and it has been shown[9] that carotene in cottonseed oil or in fresh or dehydrated alfalfa is utilised by chicks less readily than is vitamin A from fish liver oil, although the total vitamin A activity of eggs was highest when hens were fed on alfalfa. Turkey poults likewise grew better, and the liver vitamin A reserves were higher with cod liver oil or crystalline vitamin A acetate than with an equivalent amount of carotene.[10]

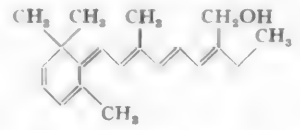
Absorption of Vitamin A by Humans

In humans, vitamin A was absorbed more readily from aqueous Tween dispersions than from oil solutions,[11] and such suspensions are said to retain their potency better than cottonseed oil solutions even with added tocopherol and lecithin—the most effective antioxidants for this purpose. Men appear to utilise vitamin A acetate better than the natural esters of vitamin A and free vitamin A best of all, as judged by blood serum levels, whereas women utilise the free vitamin and the natural esters equally well and the acetate least efficiently;[12] whatever the supplement, the increased vitamin A content of the blood was present in the form of ester. Aqueous suspensions of vitamin A and its palmitate were equally well utilised by children.[13]

Hydrolysis of Vitamin A Esters

A factor capable of hydrolysing vitamin A esters was shown to be present in the blood of man, rats, and rabbits,[14] while in sheep and cattle almost complete hydrolysis of vitamin A esters took place in the intestinal lumen.[15] The mucosa, however, contained vitamin A mostly in the form of ester, irrespective of whether the free or esterified vitamin had been administered to the animal. Apparently, therefore, the free vitamin is esterified in the intestinal wall, and then remains esterified, since most of the vitamin in the lymph is in the form of ester. Earlier reports that the intestinal wall is the site of conversion of β-carotene into vitamin A have also been confirmed recently.[16]

The constitution of vitamin A_2, first isolated from the retinae of fresh-water fish, has been the subject of considerable controversy, and recently doubt was cast on the formula hitherto assigned to this substance.[17] The following formula has now been suggested:[18]



The latest value for the biological activity of vitamin A_2 is 1,300,000 i.u. per g.[19] It is stored in the liver of rats with an efficiency somewhat less than that of vitamin A, and it is not converted into vitamin A *in vivo*.

An event of considerable scientific interest is the reported synthesis of β-carotene by P. Karrer and C. H. Eugster in Switzerland and by N. A. Milas and his co-workers in the U.S.A.[20] That this natural pigment, containing 40 carbon atoms and 11 double bonds and capable of existing in numerous stereo-isomeric forms, has at last been synthesised must be regarded as one of the outstanding triumphs of synthetic organic chemistry.

Other Fat-soluble Vitamins

New methods of preparing the provitamin of vitamin D_3, namely 7-dehydrocholesterol, have been described. In one method,[21] the pyridinum sulphate of 7-β-hydroxy-cholesteryl phthalate is heated in xylene, while in another method[22] 7-hydroxy-cholesterol or a derivative is converted into the corresponding halide and the elements of hydrogen halide are then removed by treatment with a suitable base; alternatively the halogen compound is prepared by the action of a suitable reagent such as bromosuccinimide on cholesterol.

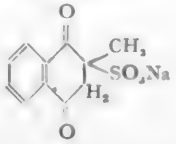
Irradiated 7-dehydrocholesteryl halides were found to be devoid of antirachitic activity.[23] $\Delta^{5:7}$-Norcholestadien-3β-ol is claimed as a new provitamin D,[24] while a new precursor of vitamin D_3, designated as "pre-calciferol-3," has been isolated from irradiated 7-dehydrocholesterol in the form of a crystalline dinitrobenzoate.[25]

A useful and interesting account of the history of the international standard of vitamin D has been published by K. H. Coward.[26] This gives details of the new International Standard adopted by the World Health Organisation in June 1949. The new standard, which replaces a solution of irradiated ergosterol, is a sample of crystalline vitamin D_3 kept at the National Institute for Medical Research, Mill Hill, and the International Unit of vitamin D is the activity of 0·025 μg. of this material.

The relative potencies of the old standard, the new standard, the B.S.I. standard, the U.S.P. Reference Cod Liver Oil, and calciferol were compared in thirty-three laboratories in eight different countries—an excellent example of international co-operation.

Interesting possibilities in relation to the estimation of vitamin D are foreshadowed by the announcement[27] that vitamins D_2 and D_3 reverse the bacteriostatic effect on *Lactobacillus casei* of certain long-chain unsaturated fatty acids, *e.g.* linoleic acid, and that between certain limits the reversing effect is proportional to the concentration of the vitamin.

None of the publications relating to vitamin E that has appeared during the year suggests that it is of any importance in human nutrition, neither does the vitamin seem to have any specific therapeutic properties. Little interest has been shown in vitamin K, although a paper has been published[28] suggesting that the bisulphite compound of 2-methyl-1:4-naphthaquinone, which is widely used in medicine for the treatment of certain forms of haemorrhage, has a formula different from that hitherto accepted; the following structure is proposed:



Vitamin C and "Vitamin P"

A paper of considerable historical interest has been published[29] in which it has been demonstrated that the Kerguelen cabbage (*Pringlea antiscorbutica*), found on an island in the Antarctic Ocean and used by Cook and later explorers as an antiscorbutic, does in fact contain vitamin C—in proportions more than ordinary cabbage and the same as broccoli or parsley.

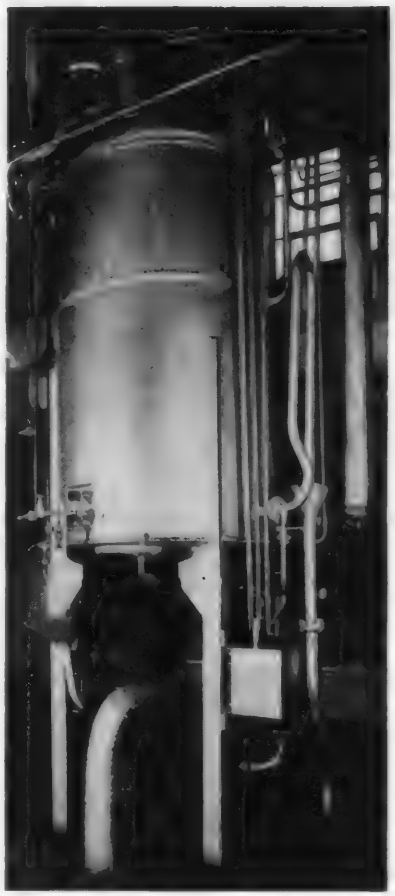
Ascorbic acid containing radioactive carbon has been synthesised from radioactive glucose,[30] and it has also been shown using glucose similarly labelled that ascorbic acid is synthesised in the rat from glucose.[31] Ascorbic acid forms a non-toxic, antiscorbutically active palmitate and laurate.[32] A stable solution of ascorbic acid is said to be produced by the addition of not less than 50 per cent. of glycerol.[33]

The vitamin P controversy appears to have been settled by a recent recommendation of the Federation of American Societies for Experimental Biology that "the term vitamin P should no longer be employed." The reasons are sound enough, for Szent-Györgyi's claim to have discovered a vitamin deficiency, the characteristic symptom of which was an increase in the permeability of the capillaries, has never been convincingly confirmed.

It still remains an open question, however, as to whether hesperidin, rutin, or certain other flavonoid substances may not have a specific pharmacological effect on capillary permeability. On this score the evidence is still conflicting, although the suggestion that none of these substances is a vitamin will probably meet with general approval.

Thus on the one hand it is claimed[34] that rutin, quercitin, and hesperidin chalcone decrease cutaneous capillary permeability in experimental animals and give considerable protection to rats and dogs exposed to near-lethal doses of radiation, and on the other hand that administration of rutin caused no significant change in capillary permeability or fragility in man and produced no specific therapeutic effect.[35]

This discrepancy may be due to differences in the behaviour of various species, and would appear to call for additional experimental work, but clearly such work must now be regarded as falling within the sphere of experimental therapeutics rather than that of nutrition.



Fermenter used in the production of vitamin B_{12}.
Photo The Distillers Co. (Biochemicals).

Aneurin and Riboflavin

Little that is of nutritional significance has been written about aneurin during the year. Additional symptoms of vitamin B_1 deficiency in the rat have been reported, including specific effects on the heart and liver, and it has been stated that auriculo-ventricular block is not infrequent in human beriberi and is developed in aneurin-deficient pigs.[36] A significant reduction in the mortality due to beriberi occurred in certain areas of the Philippines when polished rice was replaced by artificially enriched rice.[37]

The problem of intestinal synthesis of members of the vitamin B complex was referred to in last year's review, in which it was stated that it was not yet clear whether vitamins were synthesised in this way in man and, if so, whether they were absorbed. It has recently been shown[38] that the urinary excretion of aneurin is considerably reduced by the oral administration of certain sulphonamides, at first sight confirming the view that intestinal bacteria do in fact supply some of the aneurin required by humans.

An alternative suggestion has now been put forward, namely, that these sulphonamides inhibit the synthesis of thyroxine by the thyroid gland and thus decrease the needs of the body for aneurin.[39]

A new form of aneurin, the nitrate, has been introduced into pharmacy. It is less hygroscopic than the hydrochloride and gives a more stable tablet.[40] Considerable deterioration was found to occur in other pharmaceutical preparations however.[41] Nicotinamide hydrochloride has been claimed to stabilise solutions of aneurin.[42] Nicotinamide is also said to stabilise as well as solubilise riboflavin,[43] while fusion with nicotinamide, urea, and other amides is claimed to give a soluble form of riboflavin.[44]

An extremely soluble form of the vitamin was obtained by dissolving it in concentrated sulphuric acid and then neutralising the solution with lime.[45] The product appears to have a definite composition and to contain 57 per cent. of riboflavin, but unfortunately exhibited no biological activity when tested on the rat.

An important investigation on the effect of different levels of riboflavin intake was carried out on human volunteers.[46] Excretions were measured on twenty-four hour urine samples and on samples obtained four hours after subcutaneous injection of 1 mg. doses of riboflavin. The results ran parallel and indicated that the marginal level for an adult maintained on 2,200 cals. per day is between 1·1 and 1·6 mg. Healing of the skin lesions characteristic of ariboflavinosis was retarded when the twenty-four hour excretion fell below 50 μg.; this could

occur in less than four months on a diet supplying 0·55 mg. of riboflavin per day.

Nicotinic Acid

The main preoccupation with nicotinic acid during the year has been the unravelling of the very involved relationship between the vitamin and the amino acid, tryptophan, from which it is synthesised *in vivo*, and with the complicated problem of the metabolism of nicotinic acid.

It is now well established that pellagra is due to the consumption of a diet low in nicotinic acid and tryptophan, and that it is most frequent in places where maize is the staple cereal because maize contains much less tryptophan than, say, wheat. When wheat was replaced by maize in the diet of human volunteers, the excretion of tryptophan and nicotinic acid and its metabolites fell, while the symptoms of pellagra were relieved by administration of tryptophan, though not so dramatically as with nicotinic acid.[47]

Administration of tryptophan led to an increased excretion of nicotinic acid; since this occurred within three hours, the conversion presumably occurred in the tissues and not through the agency of the intestinal flora.[48] However, far greater increases in the excretion of related compounds were produced, particularly quinolinic acid, which has only a fraction of the biological potency of nicotinic acid,[49] and it appears, therefore, that only a small proportion of the tryptophan is converted into nicotinic acid, most of it forming other substances that are without biological significance.

It has been known for some time that another vitamin, pyridoxine, is the prosthetic group of a coenzyme which is in some way concerned with tryptophan metabolism, but it has now been shown[50] to play no part whatsoever in the formation of nicotinic acid from tryptophan.

With the recognition that they can be excreted in several forms, it is now possible to account for the greater part of a dose of nicotinic acid or nicotinamide. In humans, 35 to 50 per cent. of a dose of nicotinic acid is excreted in the form of N-methyl-2-pyridone-5-carboxylamide, about 15 per cent. as N^1-methylnicotinamide, and 15 to 30 per cent. as acid - hydrolysable derivatives. Nicotinamide gives a somewhat higher proportion of the first metabolites and only 3 per cent. of acid-hydrolysable derivatives.[51]

The pattern of excretion varies very considerably from one species of animal to another. Thus, in the dog, 80 per cent. of a dose of nicotinamide was excreted as N^1-methylnicotinamide and only 8 per cent. as acid-hydrolysable derivatives, whereas in the rabbit only 0·5 per cent. was excreted as the N-methyl compound and 43 per cent. as acid-hydrolysable derivatives; only in man is any significant amount of the pyridone formed, most species of animals excreting hardly any.[52]

A bound form of nicotinic acid was isolated from wheat bran. It was without biological activity when tested on the rat.[53]

A further important *in vivo* reaction involving nicotinic acid has been demonstrated and another link between two vitamins has been established by the discovery[54] that cozymase is the coenzyme responsible for the conversion in the retina of the eye of retinene (vitamin A aldehyde) into vitamin A.

Pyridoxine, Pantothenic Acid, and Biotin

Pyridoxine deficiency in young rats caused marked atrophy of the thymus gland. The deficiency could be caused by a high vitamin B_1 intake, and could be remedied by reducing the vitamin B_1 intake, as well as by increasing the pyridoxine content of the diet.[55] Calves require pyridoxine and in its absence develop deficiency symptoms which include anorexia, poor growth, listlessness, and the development of a poor coat. The required pyridoxine may however be derived from the rumen or by intestinal synthesis as well as from the diet.[56]

Evidence is accumulating that humans may synthesise pyridoxine, but it is not clear whether this is derived from intestinal bacteria or from the tissues. Results published recently[57] confirm earlier findings that the amount of pyridoxine excreted in the urine and faeces by man may exceed the amount ingested in the diet, especially if the excretion of 4-pyridoxic acid is also taken into account.

Had this enhanced output been due to bacterial synthesis in the intestine, it would have been anticipated that the elimination of pyridoxine and 4-pyridoxic acid would have been greatly reduced by the addition of sulphasuxidine to the diet. In fact, no such decrease occurred, suggesting that pyridoxine is synthesised by humans in the tissues and not in the intestinal tract.

Coenzyme A has now been isolated from liver.[58] One preparation contained 11 per cent. of pantothenic acid and another 5 per cent.; the vitamin is probably connected through a phosphate bridge to adenylic acid, and through some unknown linkage to an amino acid. The coenzyme has also been obtained from the metabolism solution of *Streptomyces fradiae*,[59] this form containing 15 per cent. of pantothenic acid combined with phosphate, adenosine, and a compound resembling cystine.

A factor previously shown to be necessary for the growth of *Lactobacillus bulgaricus* and known as the *L. bulgaricus* factor or LBF, now appears to be a compound of pantothenic acid and this cystine-like substance. It is identical with or closely related to the substance formed when coenzyme A is treated with intestinal phosphatase.[60] Coenzyme A increases the synthesis of citric acid from pyruvic and fumaric acids or from acetic or oxaloacetic acids,[61] and is therefore an essential constituent of the Krebs tricarboxylic acid cycle.

A chemical method of estimating pantothenic acid and the corresponding alcohol, panthenol, has been described.[62] The substance is first hydrolysed with acid to pantolactone which is then reacted with hydroxylamine to give the corresponding hydroxamic acid; this gives a red colour with ferric chloride. Unfortunately the

method is only applicable to the pure or almost pure substances.

Biotin, like pantothenic acid and other members of the vitamin B complex, is a coenzyme constituent or, to be more precise, a constituent of two different coenzymes, one that decarboxylates oxaloacetic acid and succinic acid, and another that deaminates aspartic acid, serine, and threonine.[63] A crystalline complex containing biotin was isolated from yeast. It has been named biocytin, and is as active as biotin in the deamination of aspartic acid and, like biotin, it combines with avidin.[64] Oxybiotin, the oxygen analogue of biotin, will replace biotin in aspartic acid deaminase, but is less active.[65].

It has been known for some time that certain beetles obtain their supplies of the vitamin B complex from intestinal symbiotic micro-organisms in a manner resembling that in which the intestinal or rumen flora helps to satisfy the requirements of some animals. Two new species of yeast have recently been isolated from two species of beetle and have been shown to produce *in vitro* considerable amounts of all the known B vitamins.[66]

Folic Acid

A number of patents have been published covering the synthesis of pteroylglutamic acid and its conjugates.[67] The general method of synthesis comprises the condensation of 2:4:5-triamino-6-hydroxypyrimidine with a halogenated aldehyde or ketone in the presence of *p*-aminobenzoylglutamic acid. Interest in folic acid appears to have declined, however, since the introduction of B_{12}, although occasional cases of pernicious anaemia are encountered that give a satisfactory response.[68] Folic acid has been shown to be closely related to a factor essential for the growth of *Lactobacillus citrovorum*, and this factor is excreted in rats and humans following ingestion of folic acid.[69] The citrovorum factor is also produced when pteroylglutamic acid is incubated with rat liver slices, and the reaction is inhibited by Aminopterin, one of the most potent of the many folic acid antagonists.[70] The citrovorum factor cures the folic acid deficiency caused by feeding Aminopterin to rats, although pteroylglutamic acid is without effect; it has therefore been suggested that Aminopterin functions by preventing the conversion of pteroylglutamic acid into the citrovorum factor. The citrovorum factor also neutralises the beneficial effect on leukemia of another folic acid antagonist, A-methopterin.[71]

Several folic acid antagonists, notably Aminopterin and A-methopterin, have been tested in leukemia and, while remissions with prolongation of life could be obtained, particularly in children, they did not prevent the inevitable fatal outcome.[72]

Some progress has been made towards ascertaining the role of folic acid in the organism. Various pieces of evidence point to its being concerned in the transformation of glycine into serine, both in animals and in micro-organisms.[73]

Vitamin B_{12}

Much is now known of the structure of the vitamin B_{12} molecule. In addition to 5:6-dimethylbenziminazole, hydrolysis of vitamin B_{12} yielded 1-α-D-ribofuranosido-5:6-dimethylbenziminazole, while milder hydrolysis produced a phosphorus-containing derivative of this substance. These two N-substituted benziminazoles are thus analogous to the pyrimidine and purine nucleotides and nucleosides.[74] There the resemblance of vitamin B_{12} to known substances of biological importance ends, however, for the other part of the molecule contains a grouping that is quite unique in such substances.

It has been established[75] that vitamin B_{12} contains a cyano group attached to a cobalt atom and the low toxicity of the substance indicates that the linkage is a very stable one; presumably the vitamin is a co-ordination compound. In vitamins B_{12a} and B_{12b} which appear to be identical, the cyano group is replaced by a hydroxo group, and the two substances can be converted by treatment with suitable reagents into the corresponding sulphato, chloro, and cyanato compounds, all of which stimulated the growth of *Lactobacillus lactis* to the same extent as vitamin B_{12}. There is thus a family of vitamins B_{12}, differing only in the nature of the group attached to the cobalt atom; the name cobalamin is suggested for the nucleus of the vitamin B_{12} molecule.

Producing Vitamin B_{12} by Fermentation

While research into the structure of vitamin B_{12} continues, technical improvements in its production by fermentation have also been made, and the crystalline material is available in the U.S.A. in quantity at less than 50 cents per mg. The vitamin has scarcely any haemopoietic activity when given by mouth, but the effectiveness is enhanced if intrinsic factor, in the form of human gastric juice or hogs' stomach *mucosa*, is given at the same time, although the results are variable.[76] Vitamin B_{12} is synthesised by bacteria in the intestinal tract of man and animals.[77]

The Animal Protein Factor

Vitamin B_{12} is a constituent of the so-called animal protein factor, which is essential for the efficient utilisation of protein by pigs[78] and chicks,[79] but it does not appear to be the only biologically essential substance present in APF concentrates. One puzzling result obtained in the course of this work was that when vitamin B_{12} was given together with aureomycin or some other antibiotic better growth was obtained than with vitamin B_{12} alone;[80] presumably the antibiotic produces some beneficial change in the intestinal flora.

Vitamin B_{12} is apparently required for the transformation of homocystine into methionine, since chicks and rats on vitamin B_{12}-free diets did not respond to homocystine with or without added betaine, but did so on addition of vitamin B_{12}.[81]

In addition to *L. lactis* and *L. leichmannii*, mentioned in last year's review, a mutant of *Escherichia coli*[82] and an alga, *Euglena gracilis*,[83] can be used for

the assay of vitamin B_{12}. A colorimetric method applicable to fairly pure solutions has also been described.[84]

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Apricot By-products

APRICOT shells and kernels are providing the basis of a promising industry in Australia, where an average of 45 million pounds of apricots are grown each year.

As a by-product of the canning industry, 200 tons of apricot stones are available each year at Leeton, New South Wales, and there are other concentrations at canneries and jam factories in Victoria, Tasmania, and South Australia.

The stones are thoroughly dried, graded, and put through a cracking machine, the bulk of the shell being screened out and the rest removed by flotation. The kernels are then dried and the oil, which can be used in place of olive oil for many purposes, is pressed out.

Standards for Cream

The Food Standards Committee have considered proposals put forward by the Milk Marketing Board, in consultation with the Central Milk Distributive Committee and supported by the Milk Division of the Ministry of Food, that standards should be prescribed specifying a minimum milk fat content for cream; and a proposal from the Milk Products Division of the Ministry that a standard of minimum fat content should be prescribed for canned sterilised cream. They have also considered the desirability of fixing standards of composition for artificial cream and synthetic cream. The Committee have discussed the various proposals, and also the question of a minimum fat content for clotted cream, with representatives of the producers, the trade, and other interests concerned in the United Kingdom and abroad.

IN the Food and Drugs Acts, 1938 to 1950, cream is defined as "that part of milk rich in fat which has been separated by skimming or otherwise," and in the Cream Order, 1950, as "cream produced from cows' milk and includes sterilised cream."

In that same Order clotted cream is defined as "cream containing at least 50 per cent. by weight of butterfat and produced in the traditional way by scalding, cooling, and skimming cows' milk or cream produced from cows' milk."

Artificial and Synthetic Cream

According to the Food and Drugs Acts, 1938 to 1950, artificial cream is "an article of food which, though not cream, resembles cream and contains no ingredient which is not derived from milk except water or any substance which may lawfully be contained in an article sold as cream, being some substance not injurious to health which in the case of cream may be required for its production or preparation as an article of commerce in a state fit for carriage or consumption and which has not been added fraudulently to increase bulk, weight, or measure, or conceal inferior quality."

The definition of synthetic cream, as given in The Use of Milk (Restriction) Order, 1945, is "any substance used as a substitute for cream and includes the substance commonly known as baker's cream filling."

The Public Health (Preservatives, etc., in Food) Regulations prohibit the addition of any preservative to cream and the sale of cream containing any thickening substance such as sucrate of lime, gelatin, starch paste, or other substance, excepting cane or beet sugar, which, when added to cream, is capable of increasing its viscosity.

In 1942 a recommendation was made by an advisory technical panel, comprising trade experts and Ministry of Food officials, that synthetic cream should be liquid at normal temperatures, and should have a minimum fat content of 30 per cent. (later reduced to 28 per cent. because of supply difficulties) and a maximum moisture content of 65 per cent. This recommendation was not given legislative effect but was observed as a working agreement by the trade. Consequent upon the revocation of the Food Substitutes (Control) Order, 1941, there is now no control over the composition of synthetic cream made in Great Britain, but a minimum fat content of 28 per cent. is laid down as a condition of licence for imports.

Preliminary discussions between the Ministry of Food and the trade interests led to the formulation of the following tentative standards:

(*a*) "single" cream containing not less than 18 per cent. milk fat;
(*b*) "double" cream containing not less than 48 per cent. milk fat;
(*c*) canned sterilised cream containing not less than 24 per cent. milk fat.

The views of the producers and of the trade have also been received on proposals for standards for clotted cream, artificial cream, and synthetic cream.

Evidence given to the Committee

The following is a summary of evidence given to the Committee:

"Single," "Double," and Clotted Cream.—A satisfactory standard for "single" cream would be one of 18 per cent. milk fat content; in practice, a minimum standard of 18 per cent. would ensure a normal milk fat content of about 20 per cent. The amount of skimmed milk for disposal would be less with a standard of 18 per cent. milk fat for cream than with a standard of say 23 per cent. as proposed in 1939. The catering trade favoured a minimum standard of 18 per cent., since this would obviate the need for a lower fat category (say 12 per cent.), which has been advocated in some quarters as a suitable standard for "coffee" cream.

Criticism of Fat Standards

The representatives of the milk producers wished, however, to place on record their opinion that the proposed standard of 18 per cent. milk fat for "single" cream should be subject to review in the light of experience. The distributors' representatives thought that no objection should be taken to the sale of cream with a fat content higher than 18 per cent. at a proportionately higher price and favoured a declaration of the actual percentage of milk fat content in such cases.

Cream used in the manufacture of butter usually has a milk fat content of about 30 per cent., well above any minimum which might be prescribed for "single" cream. There appears to be no need, therefore, to make provision for this cream.

In considering the minimum milk fat content proposed for "double" cream, the producers were of opinion that the whipping properties of a cream with 48 per

cent. milk fat content would be satisfactory; such a standard would also provide a reasonable degree of tolerance.

Clotted cream has only a restricted sale; the milk fat content is usually in the region of 60 per cent., although the Cream Order, 1950, prescribes a minimum standard of 50 per cent. It was considered that the public would not be prejudiced if the same minimum standard were applied to clotted cream as to "double" cream, *i.e.* 48 per cent. milk fat.

Homogenisation is not always desirable, and many of the smaller producer-retailers do not possess the necessary equipment; it should, therefore, be optional.

Fresh cream should be defined as a product made from cows' milk. A limited quantity of cream is made from goats' milk, and this should be appropriately designated.

The catering trade representatives agreed that cream sold in a catering establishment as part of a meal (but otherwise than as part of a composite dish) should conform to the standard. They thought, however, that it should be permissible to regard the term "cream" as signifying "single cream" unless otherwise stated.

Sterilised Cream.—A standard should be prescribed for canned sterilised cream, both home-produced and imported. It was suggested that to prescribe a standard of 18 per cent. milk fat for "single" cream and one of the order of 23 or 24 per cent. for sterilised cream would be inequitable. On the other hand, there were sound manufacturing reasons as well as economic grounds for a higher standard compared with "single" cream. Thus it was difficult in practice to ensure a uniformly satisfactory product below the level of 23 to 24 per cent. fat; it would normally be produced during the milk flush and held in stock for relatively long periods, and there was the additional cost of packing involving the use of tinplate and special equipment. There was some difference of opinion as to whether the minimum milk fat content should be 23 or 24 per cent., but it appeared that on balance a minimum of 23 per cent. would be more generally acceptable.

While sterilised cream had in the past been sold in cans, the standard should apply irrespective of the type of container, *i.e.* whether tinplate or glass. A more appropriate definition of "canned sterilised cream" would be "cream preserved by sterilisation in hermetically sealed containers." For efficient sterilisation in a continuous process the trade recommended that the product should be homogenised.

Artificial and Synthetic Cream.—There should be a standard for artificial cream, as legally defined, which should be comparable with that for cream. The catering trade suggested that the term "reconstituted" should be substituted for "artificial" in describing this product.

Synthetic cream is one of the many products included in the general description of "bakers' prepared materials." It is manufactured almost exclusively for trade use, and commonly contains, in addition to vegetable fat, small quantities of sugar, milk powder, and egg yolk; its fat content varies widely according to the use for which the product is intended.

The cream producers and distributors deprecated the use of the term "cream" for a synthetic article containing no milk fat. On the other hand, the bakery trade representatives would strongly resist any proposal to restrict the use of the word "cream" to dairy products on the grounds that the term "cream" has by custom a special significance in the bakery trade as implying a substance of a smooth consistency used for filling or decorative purposes. It was agreed that prepacked synthetic cream should bear a statement of the ingredients on the label.

The Committee's Conclusions

The Committee feel that it would be desirable to prescribe standards for cream in order to protect the public against the sale of products of low fat content.

They are of opinion that there is a large consumer demand for two types of cream—a "single" cream which pours easily and is suitable for use with fruit or with coffee, and a "double" cream with good whipping properties. A minimum standard of 18 per cent. milk fat content for "single" cream and of 48 per cent. for "double" cream should meet these requirements. They consider the minimum standard of 48 per cent. milk fat could also be applied to clotted cream.

The Committee accept the view that homogenisation of cream should be permissible.

They consider that it should be made clear in any statutory instrument which may be issued that cream is a product of cows' milk unless otherwise specified. The small quantity of "cream" made from goats' milk should be so described.

"Cream" sold in a catering establishment should conform to the standard for "single" cream unless advertised as conforming to the higher standard.

It is considered that there should be one standard only for canned sterilised cream which should apply irrespective of the type of container, and that under present circumstances a minimum of 23 per cent. milk fat would be reasonable.

The Committee see no purpose in requiring a compulsory declaration of the fat content on packages conforming to the minimum standards. No objection, however, would be raised to a declaration of the actual fat content on the labels in the case of products containing milk fat in excess of the prescribed minima.

In the view of the Committee, artificial and synthetic cream fall into a category different from that of cream separated from cows' milk and raise different considerations. The Committee, therefore, propose to deal with them in a separate report.

Recommendations for Standards

The Committee recommend that statutory standards for cream should be prescribed as follows:

(*a*) "Cream," which includes "single cream," "pouring cream," "coffee cream," and "fruit cream," means that part of cows' milk rich in fat which has been separated by skimming or other-

wise and contains not less than 18 per cent. by weight of milk fat.

(*b*) "Double cream," "thick," or "whipping" cream means that part of cows' milk rich in fat which has been separated by skimming or otherwise and contains not less than 48 per cent. by weight of milk fat.

(*c*) "Clotted cream" means cream produced in the traditional way by the scalding, cooling, and skimming of cows' milk or of cream, and contains not less than 48 per cent. by weight of milk fat.

(*d*) "Sterilised cream" means that part of cows' milk rich in fat which has been separated by skimming or otherwise and which has been sterilised, containing not less than 23 per cent. by weight of milk fat; it must be packed in hermetically sealed containers.

The Committee further recommend that:

(*a*) Cream made from goats' milk should be so described.

(*b*) The homogenisation of cream should be permissible.

(*c*) The standards should apply to cream sold in catering establishments.

Fruit and Vegetables

THE third edition of a comprehensive manual* on the manufacture of fruit and vegetable products has been published, nine years after the appearance of the second edition. It deals with every aspect of the utilisation of fruits and vegetables, whether by drying, pickling, bottling, canning, or by converting into candied fruits, jams, syrups, cordials, or wines.

Improved technological processes and equipment and advances in scientific knowledge pertaining to food processing rendered it necessary to revise and expand some of the chapters, and one new chapter on plant sanitation has been added. As this is a subject very much to the fore at the present time, it will be of considerable interest to those concerned.

The book is completely up to date, and contains chapters on vitamins, plant pigments, enzymes of fruit and vegetables, and the production of frozen fruits and vegetables. It can be thoroughly recommended as a standard treatise on food production for the use of the student, the investigator, and the manufacturer.

* *Commercial Fruit and Vegetable Products.* By W. V. Cruess. Third edition. Pp. 906+x. McGraw-Hill Book Company, Inc., London. Price 51s.

Manual for Millers

A FURTHER impression of the second edition of an already well-known book on milling science* has recently been issued. This edition was prompted by the developments in milling science which have taken place in the short space of two and a half years since the publication of the first.

The interest of the book is confined chiefly to the grain and provender milling industries, but there are chapters and features which will prove of value to other industries, particularly food manufacture.

A number of details have been modified in this latest edition, but the main changes are the inclusion of new or revised matter on conditioning, purification, pneumatic conveying of mill stocks, bulk flour storage, flour packing in paper bags, colour schemes in the mill, and the control of mill pests.

In his preface, Mr. J. F. Lockwood pays tribute to Mr. Anthony Simon, who edited and rewrote the whole of the first edition, which still forms the main body of the present book. He acknowledges the help of a number of people, including a member of the staff of Henry Simon, Ltd., who are experts in the special aspects of the subject, and also the valuable criticisms and suggestions made by Dr. T. Moran, director of the Cereals Research Station of the Research Association of British Flour-Millers, especially in connexion with the chapters on wheats, cereal chemistry, and other subjects on which he and his staff are leading authorities.

The book contains 39 chapters, grouped in three sections; the first deals with the preliminary testing, cleaning treatment, and storage of wheat. Part II deals chiefly with the processes of flour milling, and includes chapters on speciality flours, the control of mill pests, and the control of temperature and humidity. Methods of calculating milling results, power consumed by individual machines, mill staffing and management, production costs, and the layout of premises are all dealt with in Part III.

* *Flour Milling.* By J. F. Lockwood. 2nd edition, 2nd impression. Pp. 543. The Northern Publishing Co., Liverpool. Price 25s.

Modern Bakery Management

IT was as far back as the end of 1945 that *Modern Management for Bakers and Confectioners*, Book I of a series on modern management for these trades, made its appearance, and Book II,* dealing specifically with flour confectionery, has now been published.

Management in action is the keynote of this handbook, which is written primarily for students or those desiring to become managers; its scope does not include recipes or descriptions of processes.

The authors endeavour to indicate how scientific management may enable the confectioner to counter the growing competition in the trade, and to show the profit that may be expected to be obtained from any given business by describing methods for the control of production, ingredients, labour, and overheads. Calculations of wage incentives and bonus schemes for the improvement of the output and the benefit of both the management and the craftsman are described, and the different methods of costing are illustrated and explained in a clear manner.

The authors are both practical men in their particular sphere, and in consequence are competent to deal with the problems most likely to confront the would-be bakery manager.

* *Modern Management for Bakers and Confectioners. Book II, Flour Confectionery.* By E. Victor Amsdon and H. E. Turner. Pp. 79. Trade Technical Services, London. Price 10s. 6d. post free.

Future Articles

ARTICLES appearing in future issues will include "Fluorescent Tracer Agents," by J. A. Radley, M.Sc.(Lond.), F.R.I.C.; "Progress in the Baking Industry," by S. Walter Butterworth, B.Sc. (Tech.), F.R.I.C.

Vegetable versus Animal Foods

The extent to which foods from animal sources are necessary for the healthy development and maintenance of the human body has long been a controversial question, which has at times been discussed no less keenly by the general public than in scientific circles. Expert opinions on the relative merits of animal and vegetable food were exchanged and co-ordinated at a recent meeting of the Nutrition Society, held in London under the chairmanship of Professor R. C. Garry.

MOST forms of animal food, with the notable exceptions of fish and whales, are obtained by devoting areas of agricultural land either directly or indirectly to the husbandry of the animal in question. The land used for this purpose is often sufficiently fertile to grow wheat, maize, potatoes, or some other crop which is itself a staple foodstuff for humans. In comparing the virtues of animal and vegetable foods, therefore, not only must the quality and nutritive value of the products be considered, but also the quantities which can be produced per unit of land. Dr. D. A. Boyd has stated that under the conditions prevailing in Great Britain 10 or 11 units of food, measured as energy, must be given to farm animals in order to provide one unit of food for human consumption.

Quantity or Quality?

Obviously the high quality of animal foods is achieved only at the cost of quantity. An area of fertile land capable of providing a meagre vegetable diet for a large population could provide animal food for only about one-tenth as many persons. Several other factors must also be considered. Rough hillsides and barren tracts will support hardy types of sheep, although incapable of growing useful crops. In some regions labour, and not the area of land available, may be the limiting factor, and less labour may be needed for animals than for vegetable crops under the circumstances prevailing. The production of animals, moreover, is rewarded not only by food but by many valuable by-products, including hides and wool and manure to facilitate the subsequent production of vegetable crops on the same land.

The Importance of Milk

All these considerations have to be weighed up by the British farmer in the light of a system of prices which tends to encourage production along lines in accordance with Government policy. The high priority given to ensuring adequate milk supplies may be commended not only for supplying food pre-eminently suitable for children, but also for providing animal protein in the greatest possible yield per unit of fodder expended. Thus dairy cows yield protein in their milk equivalent to 3·7 per cent. of the energy value of the fodder which they have consumed, fowls yield 3 per cent., beef cattle 1·6 per cent., pigs 1·8 per cent., and sheep 1·3 per cent.

Dairy cows also share with sheep the advantage of being able to subsist largely upon grass. More energy value per acre can be obtained, with less labour, by growing high quality rye grass than by growing grain, although both these crops yield less energy than potatoes. Poultry and pigs, being non-ruminants, are unable to digest the cellulose of herbage, and have therefore to depend to a greater extent on cereal crops which require more labour for their cultivation, and which can be used directly for human consumption.

The importance of milk from both nutritional and economic angles has made it a favourite subject for research in comparisons of the relative virtues of animal and vegetable foods. In the past the majority of such studies have been concerned with the differences in the composition of the corresponding proteins, which have a predominant influence in determining the nutritive value. Quite recently, however, the problem has been complicated by the discovery of vitamin B_{12} in association with proteins of animal origin.

The Composition of Proteins

Dealing first with the protein question, these substances, which are essential components of all living matter, must be visualised as being large molecules made up of numerous different amino acids. Each amino acid has the common feature of containing a carboxyl and an amino group, but otherwise they differ considerably in their chemical configuration.

As Dr. G. R. Tristam has pointed out, some amino acids, such as tryptophan, phenylalanine, lysine, threonine, valine, methionine, leucine, isoleucine, and histidine, cannot be synthesised by the animal, and are therefore described as "essential," in the sense that they have to be supplied in the diet. Other amino acids are also present both in vegetable and in animal protein, but they can be synthesised by the animal and need not be included in the food.

Many different kinds of protein, with compositions and properties which differ considerably according to the tissues in which they are present, are included in the body of every animal. Each kind of protein, moreover, appears to adhere to a regular pattern in the arrangement of its amino acids, which are not just attached together at random.

Digestion and Assimilation

The process of nutrition therefore involves the consumption of a set of proteins which have their amino acid patterns arranged in forms typical of the food and the production in the consumer of another set of proteins made up according to different patterns. This conversion is effected mainly

by the splitting down of the food proteins to their constituent amino acids by tryptic digestion in the small intestine, and by the subsequent recombination in the body of these amino acids into the proteins characteristic of the consumer.

The complete conversion of all the protein from the food into protein in the tissues of the consumer would be possible only if the distribution of amino acids in the food protein was exactly that required for the patterns demanded by the consumer's characteristic proteins. This condition would be closely approached in cannibalism, but usually the food provides too much of some acids and a corresponding deficiency of others.

As a simple picture may be visualised a number of chains of different beads, arranged in set patterns, having to be taken to pieces and rethreaded in different patterns. The number of new chains made will not depend upon the total number of beads available, but will be limited by shortage of those beads which are needed more in the second set of patterns than in the first.

Biological Value of Proteins

The nutritive values of proteins may be estimated by including them in fixed proportions in the diets of young rats. The growth rates observed are then compared with those of other animals given the same amounts of egg albumen, which has been chosen as a protein capable of supporting growth at its maximum rate.

Casein, from milk, and the proteins of meat and fish have also high "biological values," and give growth which is scarcely inferior to that produced by the standard.

Vegetable proteins, however, are usually deficient in lysine or tryptophan, and allow much less rapid growth.

Even among the animal proteins gelatin is deficient in tryptophan and haemoglobin, from blood, in isoleucine.

Improved methods of chemical analysis have recently enabled the estimation of the amino acid contents of proteins to be made with increased accuracy, and a system of "chemical stores" has been devised to indicate how closely their composition approaches that of egg white.

In assessing the score, only the amino acid showing the greatest deficiency below the corresponding value for egg albumen is taken into account, and the score is made high when the deficit is low. Dr. K. L. Blaxter has drawn attention to the excellent agreement for the nutritive values of proteins as determined by the biological and chemical methods.

If the protein of the diet is defective in one or more amino acids, the consumer is unable to help matters either by making incomplete forms of his body protein or by saving up other amino acids, present in superfluous amounts, for future use. This predicament may occur either with a defective vegetable protein, such as zein from maize, or more rarely with a deficient animal protein, such as gelatin. All the amino acids in excess of those amounts needed to make complete proteins, in quantities determined by such small amounts of the deficient amino acid as are available, can be used only as a source of energy, for which carbohydrates and fats are more economical sources.

The presence of two defective proteins in the diet at the same time, however, often permits more efficient nutrition than if either protein were present alone. The reason for this "supplementary" action is not far to seek. Provided the proteins do not happen to be defective in the same amino acid, each will to some extent supply what the other one lacks. For the consumer forced to subsist on inferior proteins there is "safety in numbers."

Bread and Beef Tea

Dame Harriette Chick has given an admirable illustration of supplementation between defective proteins in her recent vindication of the time-honoured combination of white bread with beef tea as a light meal for invalids. In the preparation of beef extracts, the bulk of the nourishing protein of the meat is discarded. The resulting beverage contains, therefore, only the appetising non-protein extractives of the meat, together with gelatin.

As already mentioned, gelatin is defective in tryptophan, and is quite unable to support growth when tested as the sole source of protein for rats. White bread, with proteins defective in lysine, is also poor when tested as the sole food for rats, allowing only slow growth.

With the early development of a scientific knowledge of nutrition, therefore, the invalid's pick-me-up was generally discredited as being a combination of an inferior solid food and a practically worthless drink.

Dr. Chick surmised, however, that the bread might well contain enough tryptophan to compensate for its absence in the beef tea, while the gelatin of the beef tea might contain enough lysine to compensate for its deficiency in the bread. Biological experiments completely supported this assumption. In confirmation of previous experience she found that rats grew poorly when given a diet containing white flour, and worse on a diet containing gelatin, but quite well when given both these defective foods. Another example of supplementation, perhaps of even greater practical importance, was found between the proteins of wheat and potatoes.

The discovery of supplementation between proteins may be valuable not only in increasing practical knowledge, but also as a reminder that in a rapidly developing branch of science, such as nutrition, theories may be profoundly changed as knowledge accumulates.

Malignant Malnutrition

Distressing evidence of the effect of substituting the valuable animal proteins of milk by inferior vegetable sources has been observed in infants weaned in various parts of the world where the milk supplies are inadequate. In Africa, where Cecily Williams, H. C. Trowell, and other British doctors have made pioneer studies, the

syndrome of severe injuries which is often incurred by native children was first described as "malignant malnutrition," possibly because many cases ended fatally.

The native name of *kwashiorkor*, however, has now found greater favour, its meaning, "red boy," being suggested by the pale complexions of the patients and the fading of their black hair to a rusty brown. Even adults may incur the disease when subsisting on very poor diets containing little else but carbohydrates.

According to Dr. Lucy Wills, the disease is often seen in infants soon after they have been weaned from the breast on to a diet of *samp* made from Kaffir corn. They are therefore not only given a food containing defective proteins, but also are denied the opportunity of supplementation which might result from a mixture of vegetable foods.

The affected infants have diarrhoea and usually become oedematous. There is great enlargement of the liver, muscular wasting, failure in blood formation, and often cracking and peeling of the skin. Cures may usually be effected by forced feeding upon *naas*, made from the curds of skimmed milk.

Sometimes children are brought in for treatment in an atrophic rather than a swollen condition, and these cases almost invariably prove fatal.

A condition resembling *kwashiorkor* has also been reported from Jamaica by Waterlow in so-called "sugar babies," who subsist on diets containing unduly large amounts of carbohydrates. Czerny has also reported *mehlnahrschadung*, or poisoning by eating meal, from the Balkans. There is therefore strong evidence that disease caused by protein deficiency, usually involving liver injury, is quite common and widespread throughout the world.

Diets in the Far East

It is well established that diets deficient in animal protein may lead to severe, and often fatal, disease. It is equally clear that vast populations in the East are able to subsist, and to increase largely in number, upon diets much lower in animal protein than those consumed in Britain. As Dr. S. G. Willimott has pointed out, economic circumstances have necessitated their restriction to such diets for centuries. The drastic upheaval of war led to many Europeans, himself included, being restricted for nearly four years to the same meagre diet.

During the years 1939-1949 the daily consumption of animal protein in Britain ranged from 36 to 44 g. per head. The consumption in Japan before the war was 16 g., which fell to only 5 g. during the war. The Japanese Army, however, had a somewhat higher allowance of 9 g. Data collected by Dr. Willimott from camps in Java and Japan indicated that the prisoners received less than 5 g., which enabled many of them to survive over long periods on a low standard of general health.

The practical importance of supplementation between proteins was strikingly illustrated when the effects of diets typical of camps in different localities were compared. In the Southern Regions, including Singapore, over 60 per cent. of the diet consisted of rice, and the condition of the prisoners was poor. Transfer in Japan to a diet of 40 per cent. of partly polished rice, 40 per cent. of crushed barley, and 20 per cent. of soya beans, however, consistently caused an improvement in health and a steadying of the loss in body weight.

Vegetable Substitutes for Milk

Dr. R. F. A. Dean considers that few populations subsist by choice on diets which are mainly vegetable. Some races, which are obliged by scarcity to live on a vegetarian diet, eat meat in an orgy on the rare occasions when they can get it. Others add insects, such as ants, caterpillars, and locusts, to their diets when they are unable to obtain meat or fish. It is probable that if the diet of any race of fine physique were analysed it would be found to contain a set of proteins consisting of the various amino acids in amounts similar to those provided by milk protein or by those of meat or fish. The shape and formation of our teeth indicate that our prehistoric ancestors were mainly carnivorous, and that the largely vegetable diets which have followed the introduction of agriculture are an acquired habit.

The necessity of subsisting on a largely vegetable diet undoubtedly imposes its greatest strain on the newly weaned infants. In Britain the problem is solved by large and increasing supplies of cows' milk, but all parts of the world are not equally favoured. A substitute for milk made up of vegetable components is urgently required for millions of undernourished children. In the various substitutes which have been tried, soya bean meal has been a favourite component on account of its high content of nutritious protein, but flours made from wheat, rice, almonds, peanuts, and sunflower have also been used.

Cereal-Soya Mixtures

In feeding trials in Germany, Dr. Dean tested on children a mixture of malted barley and wheat with soya, which has been found by Dr. Chick to give good growth in rats. The constituents were so adjusted that 24 per cent. of the total intake of protein was derived from barley, 5 per cent. from wheat, and 70 per cent. from soya. One batch of the food was made from soya which had been steamed only long enough to remove its bitter taste, but the soya for another batch was steamed for a longer period in order to remove its trypsin inhibitor.

In two experiments groups of orphanage children, one to two years old, were given for periods of 8 or 16 weeks a simple diet of semolina, potatoes and other vegetables, butter, bread, and vitamins, which was supplemented in one group by cows' milk and in the others by the cereal-soya mixtures. Nearly all the children exceeded the standard gain in weight, irrespective of whether they were given milk or the substitute. One of the experiments, however, was marred by an outbreak of epidemic diarrhoea, which started in the group given

the soya bean heated for a prolonged period, and was probably due to the overheating of the mixture during the spray-drying process used for its large-scale manufacture.

Vitamin B_{12}

As stated earlier, the discovery of vitamin B_{12}, a pink-coloured vitamin which contains cobalt, has lead to the realisation that the comparison of proteins from animal and vegetable sources is actually a more complicated problem than was previously supposed. Fortunately young rats usually acquire stores of vitamin B_{12} from their mothers during lactation, and it is unusual for them to suffer its deficiency during the early period of growth which is used for experiments on the biological values of different proteins. Our knowledge of the relative nutritive values of the proteins themselves, therefore, may escape serious criticism. Dr. K. J. Carpenter has shown, in support of this view, that vegetable proteins are generally inferior to animal proteins, when tested upon chickens, even when they are supplemented with vitamin B_{12} and other vitamins.

It is more difficult to be sure, however, that the superiority of animal proteins over vegetable proteins in human nutrition may not at least partly be due to the associated vitamin B_{12}. Thus lack of vitamin B_{12} leads to anaemia, which is a prominent feature in *kwashiorkor*. The vitamin also aids in preventing the accumulation of fat in the liver, which is also typical of this disease. Dr. Dean considers that adequate clinical trials of vitamin B_{12} concentrates in the treatment of *kwashiorkor* are highly desirable.

Commercial Applications

The present shortage of certain forms of animal protein in Great Britain should serve to direct the food manufacturer's attention to promising vegetable substitutes.

There still seems to be scope for more extensive use of soya bean meal. The deficiency of its valuable protein in vitamin B_{12} might be corrected by the inclusion of concentrates of the vitamin which are available as by-products of the antibiotics industry. Sunflowers have an advantage over soya beans in being capable of cultivation in colder climates and, in view of the high quality of their protein, they seem worthy of further attention. While in Britain there are plentiful supplies of cows' milk for infants, there seems urgent need for a cheap, nutritious, and stable substitute, made up mainly from vegetable components, for use in those parts of the Commonwealth where dairy farming is impracticable.

Even if the proteins of meat contribute most of its nutritive value, as shown in food tables, it is the highly flavoured extractives which stimulate appetite. A little meat, by virtue of these extractives rather than on account of its protein, may encourage the consumption of much larger amounts of potatoes, vegetables, or bread.

Every effort, therefore, should be made by food manufacturers to preserve and emphasise the flavour of meat, particularly in processed products. Vegetable substitutes for animal extractives, moreover, seem worth further research and exploitation. Chinese cooks set us an example in their ability to conjure up delicious flavours from the soya bean, or to make a passable imitation of chicken soup from wheat gluten. Autolysed yeast extracts are already well known, but their value in giving a "meatier" flavour to sundry dishes should repay further study. Pure monosodium glutamate is also being increasingly used for this purpose.

Britain has now to subsist, for economical and political reasons, on a smaller share of the world's meat than she once enjoyed. Until the underlying causes of this privation are removed, food manufacturers must uphold a heavy responsibility in helping to make the best use of such foods as are available.

Feedingstuffs from Fisheries Waste

RECENT work at the Torry Research Station has proved that waste from British fisheries, which is now thrown overboard, is capable of giving a yield and type of meal as good as that obtained from the usual fish offal.

Marketable fish are gutted at sea and the guts, mainly stomachs and intestines, are thrown overboard after the roes and livers have been removed. The amount of guts available for processing into meal is about 6 per cent. of the landed weight of the fish, but it is doubtful if all of this could be brought back to port, for it would have to be carried in barrels or drums on the trawler's deck. The heads, skins, and bones left from filleting that could be brought back, however, would still be a useful addition to the supply of raw material for the fish meal manufacturer.

The main difficulty about bringing guts back to port is the rapid rate at which they putrefy. At ordinary temperatures they begin to rot inside twenty-four hours. In order to find a satisfactory method of preserving the guts for a week or two, various processes were used, including chilling in ice, steaming, adding chemical preservatives, and adding seaweed meal. The most satisfactory way was found to be that of mixing 0·4 per cent. by weight of formaldehyde with the guts. The guts themselves became firm and had very little smell. Although the surrounding liquor gradually developed a strong odour, this was not unpleasant and no putrefaction was detectable after nine days.

A large sample of meal was prepared by a commercial fish meal firm from guts preserved in formaldehyde for one week, and this and other samples made by the Torry Research Station were fed to rats. There was no evidence of any toxicity in the samples. The commercially prepared meal was later fed to pigs, who also ate it readily and safely.

The Electrical Properties of Food at High Frequencies

A. J. EDE, M.A., B.Sc., A.Inst.P., and R. R. HADDOW

Low Temperature Station for Research in Biochemistry and Biophysics, University of Cambridge and Department of Scientific and Industrial Research.

The idea of using alternating electric fields of high frequency for the heating of foodstuffs is now quite familiar and a number of advantages are claimed for the process. Firstly, rapid and uniform heating of large masses may be achieved. In other methods of heating, heat is applied to the surface and passes to the interior by conduction and, since most foods are poor conductors, this is a slow process which, in certain cases, may lead to an undesirable overheating of the outer layers. On the other hand, high frequency heating, theoretically at least, takes place uniformly throughout the mass. Secondly, rapid heating can be accomplished without recourse to a hot fluid such as water or steam to increase the rate of heat transfer to the surface; vegetables, for example, may therefore be blanched without any leaching of soluble substances. Thirdly, heat is generated in the article to be heated and nowhere else, and the consequent convenience and efficiency may offset the essential inefficiency of the production of useful heat for which only about 50 per cent. of the electrical energy used is available.

WITH one or two minor exceptions, the use of alternating electric fields of high frequency has not been applied to foodstuffs on a commercial scale, and the chief reason for this appears to be that uniformity of heating throughout the mass is very difficult to achieve. Most foods are of a heterogeneous nature, many being irregular in shape, and both of these factors tend to produce uneven heating. Even in cases where the food is an apparently homogeneous mass, such as butter or a meat paste, local overheating, sometimes on a violent scale, is often encountered. This is presumably connected with variations in the electrical properties of the food.

A number of papers dealing with the high frequency heating of foods have appeared, but most have been concerned with experiments on the actual heating of food[1-13] and comparatively few workers have obtained data on electrical properties. Dunlap and Makower[14] determined the dielectric constant and conductivity of dried carrot powder over a frequency range of 18 Kc. to 5 Mc. Hartshorn and Rushton[6] made a few measurements on ham, dried cabbage, and dried potato at 1 and 10 Mc. Sherman[15] gave dielectric constants and power factors for a number of foods of low water content, *e.g.* flour, tea, and sugar, at frequencies between 5 and 30 Mc. Shaw and Galvin[16] measured the conductivity of potato, carrot, apple, and peach at temperatures between −80° and +30° C., in the frequency range 1 Kc. to 40 Mc. The information available is thus far from complete.

An investigation has now been carried out into the variation with temperature and frequency of the dielectric constant, power factor, and specific conductivity of various foods. The range of temperatures, −30° to +100° C., includes thawing from the frozen state, cooking, and most of the sterilisation range; the frequencies used, 100 Kc. to 40 Mc., include the values normally employed in commercial generators, other than those of a "radar" type.

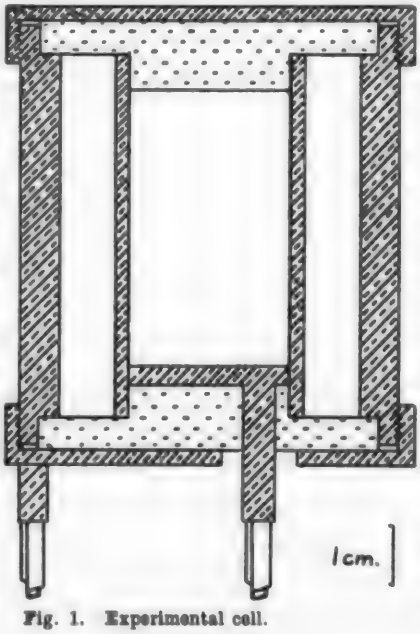


Fig. 1. Experimental cell.

All measurements were made with a Marconi Q-meter. The food was contained in a cell (Fig. 1) of a design similar to that used by Dunlap and Makower.[14] Polytetrafluoroethylene was used for the insulating material because of its inertness and rigidity at 100° C., and proved entirely satisfactory. The tests at various temperatures were performed by heating or cooling the cell in a canister surrounded by liquid at the desired temperature. The cell was provided with an insulating jacket which was brought to the same temperature and, by this means, the cell could be removed from its canister, covered with the insulating jacket, and tested on the Q-meter without a change in temperature of more than half a degree.

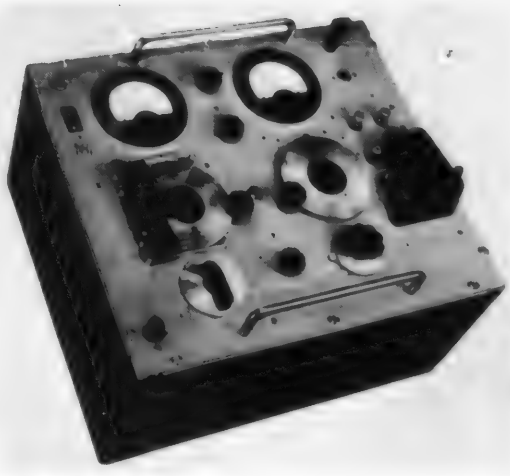
With foods of low electrical conductivity the cell, with its contents, was tested as a condenser, the dielectric constant and power factor being measured and the specific conductivity deduced. With foods of higher conductivity the cell was tested as a resistance and the specific conductivity only was obtained. The accuracy of

the results was improved by suitable adjustment of the quantity of material put in the cell. The legitimacy of employing simple formulae, based on the dimensions of the cell, for calculating the constants was checked by tests with materials of known properties.

At frequencies of 10 Mc., and above, corrections were made for the inductance in the leads of the cell and the calibrated condenser and for the losses in the latter. Despite these precautions many observations were of a low order of accuracy, because of the overriding need to carry out a whole series of tests at different temperatures and frequencies on one and the same sample of food in a reasonably short time. It was thought, however, that at this stage it was more desirable to obtain an approximately accurate overall picture than a much smaller number of results of higher precision. For the same reason, one sample only of each foodstuff was tested, though in many foods a considerable variation from sample to sample is to be expected.

Results of Samples Tested

The results obtained have been of two general types. Most of the foods examined have been found to be poor conductors rather than dielectrics, and in practically all such cases the variation of conductivity with frequency has been very small over the whole range used. Some foods can normally be regarded as dielectrics, many more being dielectrics at low temperatures, and in such cases a considerable variation of conductivity with frequency is observed. In Tables I and II, a single value of the conductivity is given, for each temperature, for poor conductors, while values at 200 Kc., 2 and 20 Mc. are given for dielectrics. Typical graphs showing the variation of specific conductivity with frequency and temperature are seen in Figs. 2 and 3.



Circuit magnification meter.
Photo Marconi Instruments.

The description of the samples tested and various experimental details and notes are as follows:

1. *Lean beef.* Composition: 75 per cent. water, 1 per cent. fat, and 24 per cent. residue, minced and forced into the cell to a packing density of 1·03 g./c.c. No significant difference was found between a sample tested at temperatures above zero, and a sample first frozen, then thawed and tested at same temperatures. There was a considerable release of fluids from the meat at higher temperatures, and this was retained in the cell.

2. *Lean mutton.* Composition: 79 per cent. water, 2 per cent. fat, and 19 per cent. residue; procedure as for (1); packing density 1·03 g./c.c.

3. *Lean pork.* Composition: 76 per cent. water, 2 per cent. fat, and 22 per cent. residue; procedure as for (1); packing density 1·02 g./c.c.

4. *Lean bacon.* Composition: 61 per cent. water, 9 per cent. fat, and 30 per cent. residue; procedure as for (1); packing density 1·00 g./c.c.

5. *Herring.* Boned, minced, and forced into cell; packing density 0·96 g./c.c.

6. *Meat paste, beef and ham.* Packing density 1·00 g./c.c.

7. *Raw potato.* Finely chopped; packing density 1·01 g./c.c. After testing the top half-inch was blackened.

8. *Raw apple.* Bramley's seedling, finely chopped; packing density 0·85 g./c.c.

9. *Cooked apple.* Bramley's seedling, simmered until soft in a small quantity of water, the excess weight being allowed to evaporate off; packing density 0·95 g./c.c.

10. *Mixed whole egg.* Eggs were broken into a bottle until it was almost filled, glass beads being added to fill. The bottle

TABLE I

SPECIFIC CONDUCTIVITY OF FOODS

Temperature (° C.).		−30			−20			−10			0	20	40	70	100
Frequency (Mc.).		0·2	2	20	0·2	2	20	0·2	2	20	All.	All.	All.	All.	All.
Food.		*Micromhos per cm. cube.*									*Millimhos per cm. cube.*				
1. Lean beef	..	1·8	3·5	10	4	10	25	40	60	90	3	6	9	12	16
2. Lean mutton	..	—	—	—	6	12	25	70	90	110	3	6	9	14	19
3. Lean pork	..	3	5	11	6	10	21	50	80	110	3	5	8	13	17
4. Lean bacon	..	—	—	—	—	—	—	—	—	—	11	22	40	60	60
5. Herring ..	..	—	—	—	26	26	26	90	90	90	2	4	6·5	10	14
6. Meat paste	..	—	—	—	—	—	—	—	—	—	6	11	17	29	35
7. Raw potato	..	—	—	—	2	4	6	18	29	35	3	6	9	11	14
8. Raw apple	..	—	—	—	—	—	—	—	—	—	0·8	1·3	1·9	2·8	4
9. Cooked apple	..	—	—	—	3	8	15	23	30	45	0·9	1·5	2·5	3·8	5·5
10. Mixed whole egg		1	2	5	4	6	11	21	35	52	0·8	4·5	7	9	12
11. Milk ..	..	—	—	—	—	—	—	—	—	—	3	4	6	10	12
12. Dough ..	..	—	—	—	—	—	—	—	—	—	0·4	0·7	1	1·3	1·6
13. Mutton fat	.	—	—	—	1·2	2·5	6·2	5	12	26	0·1	0·4	0·8	2·3	5
14. Bacon fat	..	—	—	—	37	50	100	140	250	300	0·4	0·9	1·6	3·6	2·6

was stoppered and shaken until the contents were uniform and then poured into the cell.

11. *Milk.* Full cream liquid milk shaken in bottle to re-disperse cream.

12. *Dough,* of flour 52 per cent., water 48 per cent.; packing density 0·83 g./c.c.

13. *Mutton fat.* Visible lean trimmed off, minced; packing density 0·90 g./c.c. Readings above 20° C. were of questionable value because of the separation of liquid fat from tissue.

14. *Bacon fat.* As (13) but coarsely chopped; packing density 0·74 g./c.c.

15. *Beef fat.* As (13); packing density 0·87 g./c.c.

16. *Clarified beef fat.* Visible lean removed, fat rendered in boiling water, filtered, separated in funnel, and filled warm into the cell. At the higher frequencies the conductivity tended to increase rapidly, probably due to interaction between the fat and the metal. The fat became discoloured. Readings given were obtained by heating the fresh samples direct to the required temperatures as quickly as possible.

17 and 18. *Clarified pork fat and bacon fat.* Treatment and remarks as for (16).

19. *Spray-dried separated milk* of 3 per cent. water content; packing density 0·55 g./c.c.

20. *Spray-dried full cream milk* of 3 per cent. water content; packing density 0·65 g./c.c.

21. *National flour* of 3·2 per cent. water content (wet weight basis); packing density 0·70 g./c.c.

22. As (21) but water content 9·0 per cent.; packing density 0·70 g./c.c.

23. As (21) but water content 14·4 per cent.; packing density 0·74 g./c.c.

24. *Dry granulated sugar.* Packing density 0·90 g./c.c.

25. *Dry household salt.* Packing density 0·87 g./c.c.

26. *Bread crumbs.* Water content 8·7 per cent. (wet basis); packing density 0·62 g./c.c.

27. *Butter.* The cell was filled

TABLE II

Temperature °C.			*−20*			*0*			*20*			*40*			*70*			*100*		
Constant			k	tan δ × 10^3	σ	k	tan δ × 10^3	σ	k	tan δ × 10^3	σ	k	tan δ × 10^3	σ	k	tan δ × 10^3	σ	k	tan δ × 10^3	σ
Food.		*Freq., Mc.*																		
15.	Beef fat	0·2	5·2	330	0·19	—	—	—	—	—	6	—	—	22	—	—	—	—	—	—
		2	3·5	160	0·62	12	680	9	—	—	—	—	—	—	—	—	—	—	—	—
		20	3·0	70	2·3	7	500	4	7	750	63	—	—	—	—	—	—	—	—	—
16.	Clarified beef fat	0·2	3·0	61	0·02	3·5	95	0·04	3·9	49	0·02	3·7	33	0·01	3·9	80	0·04	—	—	—
		2	2·9	45	0·14	3·0	84	0·28	3·7	40	0·16	3·6	15	0·06	3·9	16	0·69	—	—	—
		20	3·0	33	1·1	2·9	62	2·0	3·2	58	2·1	3·4	32	1·2	3·6	33	1·3	—	—	—
17.	Clarified pork fat	0·2	2·7	41	0·01	3·1	36	0·10	3·3	17	0·006	3·3	2·4	0·0009	3·3	9	0·003	3·4	180	0·07
		2	2·6	38	0·11	3·0	37	0·12	3·1	19	0·065	3·2	6·0	0·021	3·2	5	0·018	3·3	48	0·18
		20	2·9	27	0·87	3·1	48	1·6	3·2	38	1·4	3·3	28	1·0	3·4	18	0·68	3·3	25	0·92
18.	Clarified bacon fat	0·2	2·8	40	0·01	3·2	110	0·04	3·4	53	0·02	3·4	7·6	0·003	3·8	120	0·05	4·0	390	0·17
		2	2·7	36	0·11	3·1	50	0·17	3·3	31	0·11	3·3	9·4	0·034	3·6	53	0·21	3·7	100	0·41
		20	2·5	33	0·91	2·9	50	1·6	3·1	52	1·8	3·4	33	1·2	3·3	55	2·0	3·3	60	2·2
19.	Dried separated milk	0·2	—	—	—	2·0	19	0·004	2·2	16	0·004	2·3	18	0·005	2·5	31	0·009	3·9	400	0·17
		2	—	—	—	2·1	18	0·042	2·1	18	0·042	2·1	21	0·049	2·4	28	0·075	3·2	130	0·46
		20	—	—	—	1·9	21	0·44	1·9	24	0·51	1·8	30	0·60	2·0	36	0·80	2·7	95	2·8
20.	Dried full-cream milk	0·2	—	—	—	2·2	13	0·003	2·3	12	0·003	2·3	11	0·003	2·5	15	0·004	3·0	82	0·037
		2	—	—	—	2·3	17	0·043	2·4	14	0·037	2·4	15	0·040	2·5	16	0·044	2·8	42	0·13
		20	—	—	—	2·1	24	0·58	2·3	27	0·69	2·2	26	0·64	2·3	24	0·61	2·5	37	1·0
21.	Flour 3·2% w/c	0·2	2·8	58	0·02	3·2	53	0·02	5·3	45	0·02	3·7	36	0·02	4·2	28	0·01	4·2	29	0·01
		2	2·4	61	0·16	2·8	66	0·21	3·1	67	0·23	3·5	56	0·22	4·0	40	0·18	4·3	30	0·14
		20	2·5	45	1·2	2·8	66	2·1	2·7	74	2·2	2·7	87	2·6	3·2	86	3·1	3·6	66	2·6
22.	Flour 9·0% w/c	0·2	4·1	75	0·03	4·4	55	0·03	4·8	50	0·03	5·0	53	0·03	5·7	120	0·08	7·4	390	0·32
		2	3·8	88	0·37	4·1	85	0·39	4·4	69	0·34	4·8	55	0·29	5·4	62	0·37	6·1	130	0·88
		20	3·0	110	3·7	3·5	100	3·9	4·0	95	4·2	4·6	88	4·5	4·7	75	3·9	4·8	95	5·1
23.	Flour 14·4% w/c	0·2	5·0	77	0·04	5·6	72	0·04	6·0	110	0·07	7·0	250	0·19	10	640	0·71	—	—	—
		2	4·6	110	0·56	5·0	82	0·45	5·2	71	0·41	6·2	130	0·90	7·3	240	1·9	8·8	520	5·1
		20	3·9	130	5·6	4·5	105	5·2	5·0	80	4·4	5·2	100	5·8	6·0	120	8·0	6·5	200	14
24.	Sugar	0·2	2·3	2·8	0·0007	2·2	9·1	0·002	2·2	19	0·005	2·3	40	0·010	2·5	79	0·022	2·6	73	0·021
		2	2·3	5·0	0·011	2·3	6·5	0·017	2·3	10	0·026	2·5	15	0·042	2·5	20	0·056	2·6	20	0·058
		20	2·4	3·7	0·10	2·3	6·0	0·15	2·3	11	0·28	2·4	14	0·37	2·4	15	0·40	2·6	12	0·35
25.	Salt	0·2	2·5	3·5	0·0010	2·4	8·0	0·002	2·6	9·0	0·003	2·5	7·5	0·002	2·5	1·9	0·0005	2·4	2·0	0·0005
		2	2·5	1·2	0·0033	2·6	2·5	0·007	2·6	2·1	0·006	2·7	2·1	0·006	2·7	1·8	0·0054	2·7	1·8	0.0054
		20	2·5	1·5	0·042	2·5	2·5	0·070	2.6	1·5	0·043	2·6	1·4	0·04	2·6	1·7	0·049	2·6	—	—
26.	Bread crumbs	0·2	—	—	—	3·3	95	0·035	3·8	110	0·05	4·8	190	0·10	6·3	390	0·27	—	—	—
		2	—	—	—	2·9	89	0·29	3·5	100	0·39	4·0	120	0·53	5·0	180	1·0	6·8	320	2·4
		20	—	—	—	2·3	87	2·2	3·0	100	3·3	3·1	130	4·5	3·7	140	5·8	4·7	200	10
Temperature °C.			*−20*			*0(1)*			*0(2)*			*10*			*20*			*30*		
27.	Butter	0·2	4·9	40	0·02	5·6	140	0·09	5·5	17	0·01	5·7	30	0·02	5·4	5	0·003	5·4	3	0·002
		2	4·7	39	0·20	5·2	55	0·32	5·2	33	0·19	5·4	30	0·18	5·4	11	0·066	5·2	8	0·046
		20	4·4	43	2·1	5·1	60	3·4	5·1	54	3·1	5·2	50	2·9	5·1	40	2·3	5·1	39	2·2

Dielectric Constant, k; Power Factor, Tan δ × 10^3; and Specific Conductivity, σ (Micromhos per cm. cube) of Foods

with soft (but not liquid) butter. First readings were taken at 0° C. as soon as the temperature was steady; the second after remaining at 0° C. overnight. Readings at higher temperatures were taken thereafter.

Shaw and Galvin[16] determined the specific conductivity of potato and apple at 25° C. over a wide range of frequencies, and a direct comparison between their results and those presented here may be made as follows, values of conductivity being expressed in millimhos per cm. cube:

	Shaw and Galvin.			*Present work.*
	200 Kc.	*2 Mc.*	*20 Mc.*	*All frequencies.*
Potato	1·8	6·5	8·1	6·0
Apple	1·3	—	1·6	1·6

The substantial reduction in conductivity obtained by Shaw and Galvin at lower frequencies was not found in the present experiments, which, however, were not carried to such low frequencies. Hartshorn and Rushton[6] determined the conductivity of lean and fat ham at 20° C. For lean ham they give 25 and 20 millimhos per cm. cube respectively at 1 and 10 Mc.; present results give, for lean bacon, 22 at all frequencies. For ham fat, Hartshorn and Rushton give 0·7 and 1·0 at the same frequencies; present results for chopped bacon fat are 0·9 to 1·3 at the same temperature. Agreement with earlier work is therefore satisfactory.

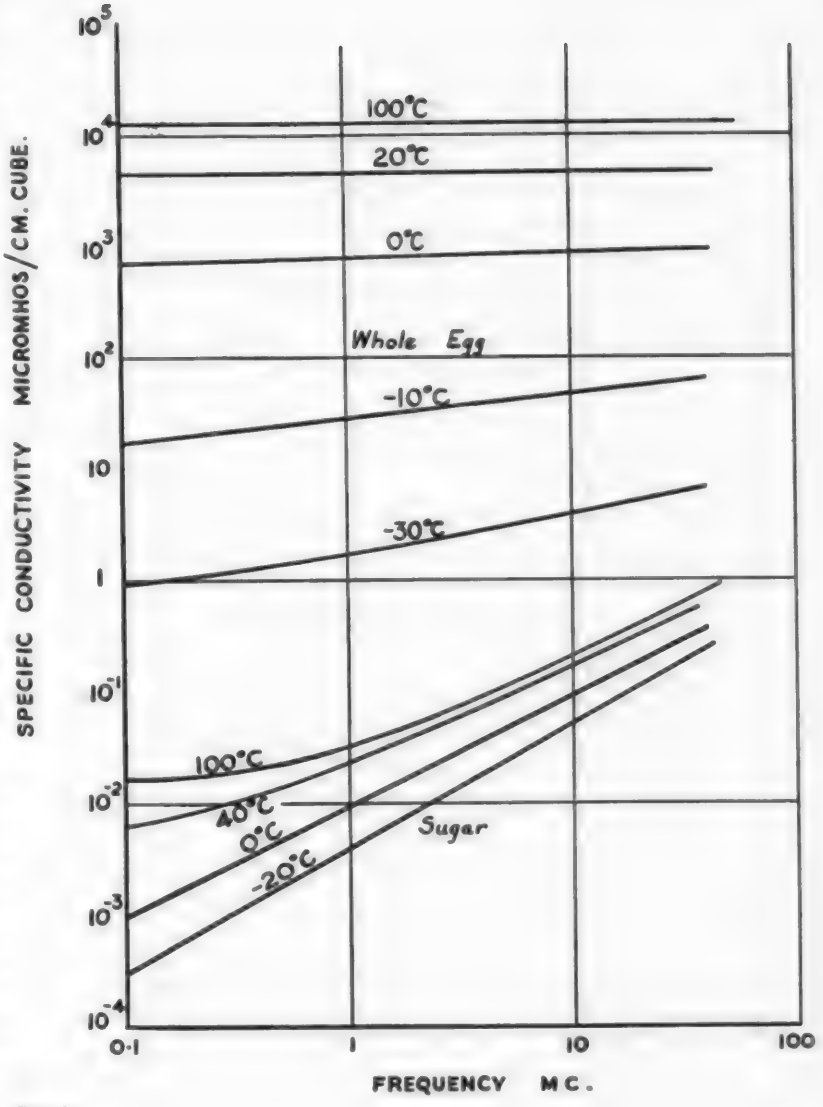


Fig. 2.

Result of Tests

The picture presented by these results shows several broad features. First is the possibility, already referred to, of classifying foods into those which are poor conductors, in which case conductivity varies very little with frequency, and those which are poor dielectrics, in which case the variation with frequency is considerable and may reach direct proportion (Fig. 2). Second is the general effect of temperature—with a very few exceptions conductivity increases with temperature. In a typical "conductor" such as beef a rise of 10° C. increases the conductivity by 30 per cent. (Fig. 3). Third is the effect of freezing on foods of high water content; an abrupt and very large reduction in conductivity, as the temperature is lowered, accompanied by a gradually increasing variation with frequency as the substance becomes more like a dielectric.

Uniformity of Heating

The reason for the difficulty in obtaining uniform heating, even in foods which appear homogeneous, is therefore clear. Considerable variation in conductivity may arise from differences in temperature and these variations may cause differential heating in a manner tending to increase still further the differences in temperature, the process becoming unstable and leading to the rapid local overheating which is frequently encountered. There would seem to be no obvious way of escape from this difficulty, which appears in a far worse form in the majority of foods which are not even approximately homogeneous.

A partial solution might be found either in continually changing the direction of the applied field, for instance, by rotating the article to be heated, in order to vary the effect of local differences in conductivity, or in reducing the intensity of the field to such a value that local overheating is prevented by thermal conduction from assuming too

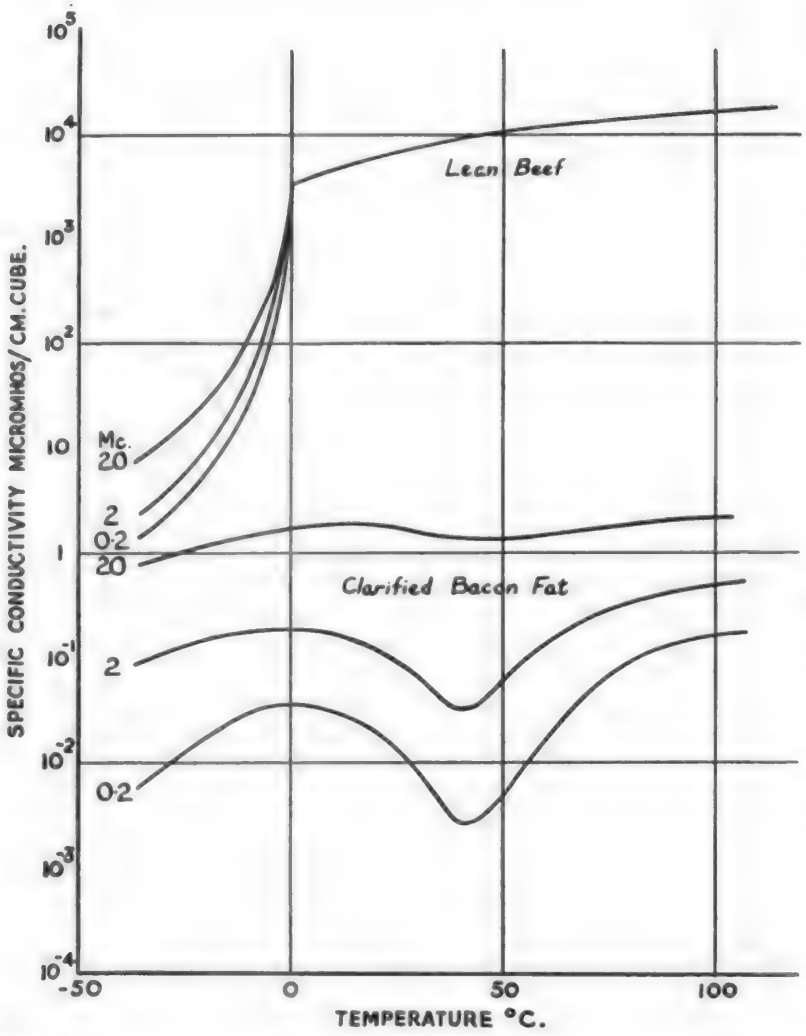


Fig. 3.

severe a form. No advantage can be claimed for any particular frequency, except that it would be expected that a food consisting of a mixture of conductor and dielectric would heat with a nearer approach to uniformity at the highest frequencies, since the conductivity of the dielectric portions most nearly approaches that of the conducting portions at the highest frequencies.

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Refrigeration of Foods

In October, 1948, a technical meeting on the refrigeration and storage of food was convened in Europe at the instance of a number of FAO member governments. It was held in response to requests for expert assistance and recent information in this field from a number of countries cut off from new developments during the war period. It was attended by representatives from twelve European countries, and was cast on a highly technical level with a view to providing specific scientific information and an opportunity for full discussion of a number of new techniques in the whole field of refrigeration and freezing of food.

A recent publication* is an attempt to summarise and synthesise the major portion of the valuable scientific information made available by lectures and discussions at this meeting. The publication constitutes an effort to bring together the food freezing and refrigeration problems contended with by European countries and includes some recent technological developments. The publication retains the same technical approach as the meeting, and is therefore primarily of value to technical and professional people working in these fields. It does not attempt to be exhaustive, and limits itself exclusively to the subjects and information discussed at the meeting.

The publication is divided into chapters devoted to: the principles of refrigeration; ice-production and use; household refrigeration, home freezers, and locker plants; construction of cold storage plants; refrigerating machinery; methods and apparatus for commercial freezing; packaging materials and machinery; judging flavour, colour, and texture of foods; plant sanitation; chilled and frozen foods; transportation of chilled and frozen foods in Europe; marketing frozen foods in Europe; and conversion factors.

* *Some Aspects of Food Refrigeration and Freezing.* FAO study edited by Donald K. Tressler. Pp. 205+x. H.M.S.O., London. Price 14s.

Pectin in Jam and Jelly Standardisation

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Modern methods of jam and jelly manufacture call for constant control of the raw materials involved, *viz.* fruit, sugar, and acid, together with pectin, which constitutes a very important aid to standardisation.

THE term "pectin" is used to denote a collection of chemical substances which are capable of forming fruit jellies with the correct amount of acid and sugar. The presence of pectin in reasonably high proportions has been established in such vegetables as carrots and green pea pods, but its recovery from such sources is not at present economical compared with its extraction from the chief commercial sources, *i.e.* citrus, apple, and beet wastes. Of these, citrus pectins are available in the largest commercial quantities and range of types.

Pectin may be classified into slow setting and rapid setting types. There is also the low methoxyl type which possesses some remarkable properties, the chief of which is its ability to form firm gels with relatively low amounts of sugar and acid.

Importance of Setting Speed

The speed of set in pectin solutions is an important item. Rapid set types are desirable for jams containing small dispersed particles that have a tendency to float out of the jam mass, *e.g.* raspberry seeds, although too rapid a set of the jam will cause an undesirable breakdown of the final product. Knowledge and control of the pectin type used is therefore essential when this substance is to be incorporated in a standardised article of food.

Methods of Grading Pectin

The difficulties of grading pectin have impelled physical chemists to search for a simple, speedy, and efficient method of assessing the value of a powdered or liquid pectin, so that reproducible results could be forecast when using any one grade of pectin, all other factors being constant.

After many years of research, the method devised by Cox and Higby (described in FOOD MANUFACTURE, **19**, 6, 199) has been generally accepted. By this method, a standard gel is made in a calibrated glass vessel and inverted on to a special plastic platform or plate. The percentage of sag of the gel is then measured by a micrometer screw which is adjusted until it just reaches the top of the jelly. Reference is then made to a calibration curve and a simple formula is worked out to give the grade of the pectin under test.

Until quite recently, individual manufacturers of pectin had their own standards and graded accordingly, but it is hoped that an international grading basis will eventually be established.

Briefly, a grade of pectin may be defined as the number of pounds of sugar that one pound of pectin will make into a standard gel under a standard set of conditions involving time, temperature, *p*H, and reagents, the final jelly having 65 per cent. concentration of sugar.

Properties of Pectin

Pectin decomposes on heating above 158° C.; it absorbs about 15 per cent. of water without undergoing any change, but when placed in cold water it swells and slowly dissolves, and its solution can be hastened by heating and agitation.

Pectin is insoluble in alcohol and only partly soluble in strong sugar solutions. It is soluble in water, forming a viscous colloidal solution which flows readily at ordinary temperatures, but its solubility depends on (*a*) the origin of the pectin, *e.g.* citrus pectins are not so easy to disperse as apple pectins; (*b*) the age of the pectin; and (*c*) the order of addition to the aqueous medium, *i.e.* the pectin must be added to the water or fruit before the sugar, otherwise the result will be the producion of a poor gel.

Gelling Property

Gelling occurs when the pectin is combined with acid and sugar, and this property also varies according to (*a*) the origin of the pectin; (*b*) the age of the pectin, the gelling properties deteriorating on storage, especially in the first few months; and (*c*) the method of storage; pectin should be stored at 34° C.

The gelling property of pectin is affected adversely by heat and excess acid owing to the change which is produced in the substance itself.

Solutions of pectin are not so stable as the powdered product, and deteriorate much more rapidly. Over a period of time the viscosity of the solution will be markedly reduced.

Requirements for Gel Formation

The obtainment of a satisfactory gel depends chiefly on the correct concentrations of sugar, *p*H, and pectin.

The natural sugar content of the fruit must be taken into consideration and allowance made for the method of manufacture, *e.g.* open boiling or vacuum pan operation, before the amount of cane sugar to be added is decided upon. The final sugar concentration, which is best determined by refractometer, should not fall below 65 per cent. or rise above 70 per cent.

The *p*H range must lie within the limits of 2·6 to 3·3. Too low a *p*H results in a breakdown of gel structure, and a high *p*H results in a weak gel or even its absence.

The concentration of pectin depends upon the origin of the pectin, the pectin grade, and the final sugar concentration. The

usual concentration of pectin is from 0·25 per cent. to 0·6 per cent. of 100 grade or the equivalent thereof.

Standardisation of the Product

In assessing the standard for gel strength there are several factors to be considered, the chief of these being whether the product is for home consumption or for further manufacture; the size of the can in which the product is marketed; and the general method of handling.

If, for example, a jam is required for home consumption only, it may be packed in small cans. In this case the gel strength can be quite weak without causing undue deterioration or drop in demand for the product. On the other hand, such a weak gel would not be of any use if the jam were to be marketed in 56 lb. cans and used, say, in tarts, where the high cooking temperature would cause the jam to boil over, thus spoiling the appearance of the article. Furthermore, if the batch of jam is made in small pans, it is much easier to control, and the specifications of gel rigidity may be lower than for jam batches prepared in one very large pan.

Once the type of product to be manufactured has been decided upon, certain rules of procedure to produce a standard gel must be followed in the actual preparation, *i.e.* there must, as already stated, be a specified pectin-sugar-acid balance.

Testing Gel Strength in Jams

Assuming that standards have been set up and all the rules of jam-making adhered to, the next step is to assess the strength of the gel. Several methods exist for this purpose, a simple but successful one being known as the penetrometer method; its use is, however limited to jams which do not contain large pieces of fruit.

In this method, a pectin gel is prepared to a standard formula under standard conditions and is allowed to set. After twenty-four hours, it is examined by means of the penetrometer and, according to the distance that the instrument penetrates into the gel, the rigidity, and hence the gel strength, can be calculated.

Finally, the product must be prepared in a systematic manner so that the process is identical with every batch. In this connexion, the manner of the addition of pectin cannot be over-emphasised. A practical method which will ensure the standardisation of pectin addition is to mix the dry pectin with five to six times its weight of sugar and to sprinkle it slowly into warm water (about 60° C.) under constant agitation by means of a high-speed mechanical stirrer. This results in a viscous colloidal solution ready for addition to the mix. An even better solution will be obtained if it is allowed to stand overnight.

The point at which the addition of ingredients is made is also important. For instance, if the acid is added at such a time that boiling takes place in its presence, the pectin will break down and a weak gel will result. This will also occur if the batch takes a considerable time to prepare and overheating results.

The Correct Procedure

The ideal procedure is to boil the fruit for a determined time, then, while hot, to add the pectin, which is already in solution with constant agitation, and intimately to mix the whole. The sugar is then added and the product is heated until the refractometer reading is between 65 and 70 per cent. The product is then cooled to a suitable pouring temperature, colour is added if necessary, and, just before pouring, the acid is added with constant stirring and the mixture is transferred to pans. Where the mix is poured straight into the cans without cooling, the acid is again added immediately before pouring.

Regulating Plant Growth

PLANT growth-regulating substances can bring about a variety of interesting responses in the growing plant, and certain of these chemicals are finding widespread uses in agriculture and horticulture for such purposes as selective weed control, promoting rooting in cuttings, prevention of fruit drop, setting fruit, and so on, it was stated by Prof. R. L. Wain, of Wye College, Kent, during his talk on "Plant Growth-regulating Activity in the Aryloxyaliphatic Acids," given before the Crop Protection Panel of the S.C.I. Agriculture Group.

Among the more important of the synthetic plant growth-regulating substances are certain aryloxyalkylcarboxylic acids. Some of these, when applied through the roots or to the base of the stem, may produce growth responses all over the plant, and it is therefore possible that such chemicals can be translocated, *i.e.* transported within the plant.

Prof. Wain first dealt briefly with the various methods available for assessing growth-regulating activity. He then examined such activity in relation to chemical structure, and showed that by certain types of substitution and other means, biological properties could be profoundly altered. Particular attention was given to those compounds which are inactive as growth substances yet whose structure is such that they might well be translocated within the plant. Some of these compounds were being examined by Mr. S. H. Crowdy and Prof. Wain as "systematic" fungicides—substances which can enter the plant and confer some protection against fungal attack. The method adopted in testing systematic fungicidal action was described by Prof. Wain, and he discussed the results so far obtained.

Certain aryloxyalkylcarboxylic acids are apparently broken down within the plant, and such behaviour was discussed in relation to chemical structure.

The paper, which was mainly chemical, included work being carried out at Wye College by the professor and his colleagues. Some 25 slides were shown, many of which illustrated the effect of growth substances on plants and plant tissues.

News from the Industry

FORTHCOMING EVENTS

Nutrition Society

The date of the annual general meeting and scientific meeting of the Nutrition Society is May 26, 1951, and not May 19, as previously announced..

Members of the Society (or others introduced by members) are invited to read papers or give demonstrations at this meeting. Abstracts of papers (250 words) and details of demonstrations (giving such requirements as microscopes) should be sent to Dr. G. Bourne, London Hospital Medical College, London, E.1, not later than May 15. The abstracts should be in their final form (proofs are not sent out), and should be prepared according to the instructions to authors published in the Society's journal.

The Scottish Group will hold their annual business meeting and a conference on milk at the Hannah Dairy Research Institute, Kirkhill, Ayrshire, on April 21, 1951.

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1951 Minibition

Following the success of the first "Minibition," organised by the Purchasing Officers' Association at Brighton in September 1950, arrangements have been made for this exhibition to be repeated at the Craigside Hydro, Llandudno, from September 27 to 30, in conjunction with the Association's 1951 National Conference.

The Minibition, which is the only annual exhibition organised by buyers for buyers, is designed so that the maximum information regarding exhibitors' products can be displayed attractively and economically, the stands, all of one size, being situated adjacent to the main conference room.

*

R.S.I. 1951 Health Congress

The Right Hon. Lord Hesketh, D.L., has accepted the office of President of the Health Congress of the Royal Sanitary Institute, which is to be held at Southport from April 23 to 27 next. He will address the delegates at the inaugural meeting in the Floral Hall on the opening day of the Congress.

The subjects to be discussed at the Congress, which are of special importance to local authorities and other public bodies at the present time, cover preventive medicine; engineering and architecture; maternal and child health; veterinary hygiene; food and nutrition; housing and town planning; tropical hygiene; and hygiene in industry.

Of particular interest to the food industry will be a discussion on "Composition and Scientific Control in the Manufacture of Ice Cream, Synthetic Cream, and other Emulsified Food Products," held in conjunction with the Food Group of the Society of Chemical Industry; papers on industrial hygiene and health; and a conference of sanitary inspectors on "The Administration of the Milk Regulations of 1949: Some Observations on their Operation;" "Food Hygiene: Theory and Practice;" and other matters concerning public health.

During the Congress, delegates will visit numerous public and industrial undertakings in Lancashire and Cheshire, including industrial estates, food factories, agricultural colleges and dairy farms, and various engineering works.

The Institute has accepted an invitation from the Corporation of Margate to hold the 1952 Health Congress there from April 22 to 26 inclusive.

*

The Chemical Society

The programme of London meetings of the Chemical Society up to June, 1951, is as follows:

Apr. 26. Centenary lecture. "Some Recent Advances in the Chemistry of Natural Products," Prof. R. B. Woodward (Harvard). 7.30 p.m. in the rooms of the Society in Burlington House, Piccadilly, London, W.1.

May 10. Liversidge lecture. "Transient Entities in Chemical Reactions," Prof. H. W. Melville, D.Sc., F.R.S. 7.30 p.m. in the lecture theatre, The Royal Institution, Albemarle Street, London, W.1.

June 7. Tilden lecture. "A Chemotherapeutic Search in Retrospect," Dr. F. L. Rose, O.B.E., F.R.I.C. 7.30 p.m. in the lecture theatre, The Royal Institution, Albemarle Street, London, W.1.

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Refrigeration Congress

With His Majesty the King as patron, the Eighth International Congress of Refrigeration, to be held in London from August 29 to September 11, under the Presidency of Viscount Bruce of Melbourne, will reflect the innumerable services rendered by refrigeration in peace and war.

Those attending the Congress, which is being held under the auspices of the International Institute of Refrigeration, will have the opportunity of seeing the application of refrigeration to all manner of manufacturing plants. They will be able to join in an extensive programme of industrial visits, when refrigerating installations will be exhibited, and receptions accorded by sundry authorities and corporations.

The British Government will provide accommodation for the meetings at Church House, Westminster, and official receptions will be accorded to delegates in London and other parts of the country. The Institute of Refrigeration, which is the oldest national society of refrigeration in the world, and the British Refrigeration Association will offer hospitality to Congress members.

Application forms for membership may be obtained from the secretary, Eighth International Congress of Refrigeration, Dalmeny House, Monument Street, London, E.C.3.

Prefolder Gluing Machine

Closely following the most up-to-date American design, but shortened to reduce the floor space required, the British-built Staude 180 prefolder gluing machine, Autocrat, incorporates many improvements to simplify setting and changeover from one type of carton to another. The prefolder stage has been developed for prefolding the first and third scores. Overhead glue pots can be added to equip the machine for gluing and compound folding double-wall boxes, and for executing a number of other special requirements.

Where a shorter installation without full prefolding is required, Industrial Products (Speco) supply the Zephyr machine.

Erections and Extensions

The rebuilding of their Southampton depot is planned by Cadbury Bros.

*

Plans for extension of their South Shields factory have been prepared by Wright's Biscuits.

*

A £23,000 extension of factory premises is to be made by Crosse and Blackwell at their canning depot at Peterhead.

*

Extension of their premises at Lammas Road, London, E.10, is proposed by the British and American Salmon Curing Co.

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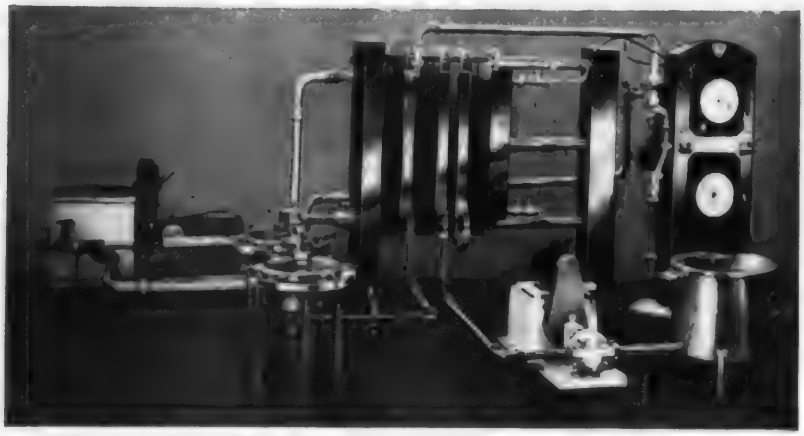
Work has commenced on the building of a new bacon-curing factory on a site at Three Bridges, Cardiff Road, Newport, Monmouthshire, for Pitchford and Son. Cost of this project is estimated at £75,000.



Multi-Pass H.T.S.T. processing plant.

H.T.S.T. Instrumentation

With a given amount of heat transfer surface it is possible accurately to control temperatures of heated milk merely by controlling the heating water, and the Creamery Package Company have utilised this principle in providing a simple system of H.T.S.T. control instrumentation.

Control of hot water is achieved by the combination of a self-acting steam pressure regulator in the steam line, followed by a thermostatically controlled electro-hydraulic modulating valve; this has its own electric motor driving a small gear pump which circulates oil on to a diaphragm. The pressure of oil on to this diaphragm is governed by a thermostatically controlled bleed valve, and the sensitive element of this valve is on the hot water line. In this way water temperatures can be maintained correct to $\pm \frac{1}{4}^{\circ}$ F.

A normal thermograph records the temperature to which the milk is heated; incorporated in this is a pair of electric contacts which, operating through a relay, actuate a solenoid-operated flow diversion valve.

The cold milk temperature may be controlled in a similar manner.

All normal H.T.S.T. pasteurisers have a regeneration section incorporated, which carries 70 to 80 per cent. of the full heating and cooling loads. If diversion takes place, therefore, this whole section becomes inoperative and the recorded temperature of the milk immediately drops to a noticeable extent. Conversely, if the temperature drops below the control point and no diversion takes place, this is immediately shown by lack of temperature drop in the recorded milk line.

Steady Trade in Chocolate Enrobers

A steady volume of trade in the latest type of chocolate wafer and chocolate ice enrober, both at home and overseas, is reported by British manufacturers. This is attributed to the flexibility of such units, together with a general preference for chocolate-coated products.

One large firm of manufacturers, who exhibited at the Scottish Dairy Show, report steady consignments to Australia in recent months, with orders still coming in. Hong Kong and many other parts of the Empire have been supplied with plant, and considerable scope for well-designed, economical machines of this type is believed to exist in Scandinavia.

Although the present metal situation may influence ultimate deliveries and also the supply of spares and replacements, most of the major companies believe that they will be allowed to carry out their export commitments. In most cases they are urging the placing of provisional orders at an early date, even if positive orders are not possible, so as to enable them to plan ahead.

Purchase of U.S. Food Company

Their purchase of the E. C. Rich Company, 401, W. 13th Street, New York, manufacturers of crystallised ginger in the United States for 90 years, has been announced by J. Lyons and Company.

The American company's crystallised Canton ginger and wine jelly will continue to be made and will be distributed in the U.S. along with imported Lyons products such as marmalade, blackcurrant jam, sweets, biscuits, Dundee cakes, and Christmas puddings.

Industrial Essay Competition

Open to anyone employed in industry in the U.K. who is within the age limits specified, the Institute of Works Managers' essay competition for 1950-1 is on the subject of the general scheme of organisation which might be set up, with particular reference to the duties and responsibilities of the works manager, by the managing director of a new company which is planning mass production of, for example, a new pre-packed food for which there is expected to be a popular demand.

The essays, which should be about 2,000 words long, will be marked in two grades; the judges will look for original thought and practical suggestions based on first-hand experience, in addition to accepted practice.

The winner in the senior grade will be awarded the Sir Henry Fildes Medal. Other awards, aimed at helping the winner in his career, may be in the form of books or scholarships for suitable courses.

Entries should be sent to the general secretary of the Institution before April 30, 1951.

Brown and Fruit Rolls

Two new varieties of Procea bread —a brown roll and a fruit roll—were on sale, fresh from the oven, at the Ideal Home Exhibition.

The rolls were baked in a three-tier gas oven installed in a model bakery which was one of the features of the Procea Products stand.

Like the white rolls, both the brown and fruit rolls are baked in the form of miniature loaves. The brown rolls follow closely the formula for the brown loaf and have a finished weight not exceeding 2 oz. The fruit rolls, which have a high fruit content, are similar in composition to the company's fruit loaf.

Autoclaves and Reaction Vessels

In view of the fact that the chemist, chemical engineer, and research worker are handicapped by the lack of published information on the variety of designs of autoclave and reaction vessel for specific use in laboratories and pilot plant work that are available as standard items, Kestner's have developed three principal types—direct heated, jacketed, and internally heated units.

Each of these is available in many different materials of construction and sizes and is suitable for a wide range of working temperatures and pressures. A description of the units is given in a leaflet recently published by the company.

Kimpton's Anniversary Celebration

To celebrate their 69th anniversary, a staff dinner was held recently at the Holborn Restaurant by Kimpton Brothers, producers of Red Carnation powdered gum tragacanth and importers of waxes, honey, and spices.

Mr. A. C. W. Kimpton, the managing director, replying to a toast proposed by the export manager, Mr. G. L. Vincent, traced the growth and progress of the firm and said that the year 1950 had again been a record one in every way, the turnover of the company being some fourteen times greater than it was ten years ago.

Essence Manufacturers' Centenary

FLAVOURS PRODUCTION FROM OUNCES TO TONS

In the year 1851, to meet the demand from his customers, Mr. John Rayner, a retail chemist, compounded in his shop at Herne Hill simple flavours which he sold by the ounce. This marked the commencement of the business of Rayner and Co. as essence manufacturers.

As his flavourings became known in the district, the demand for them developed until it was worth his while taking a separate workroom for their production. Suitable premises were found at Clerkenwell Green and a wholesale trade was started, Rayners' essences thenceforth reaching the public through the grocery trade.

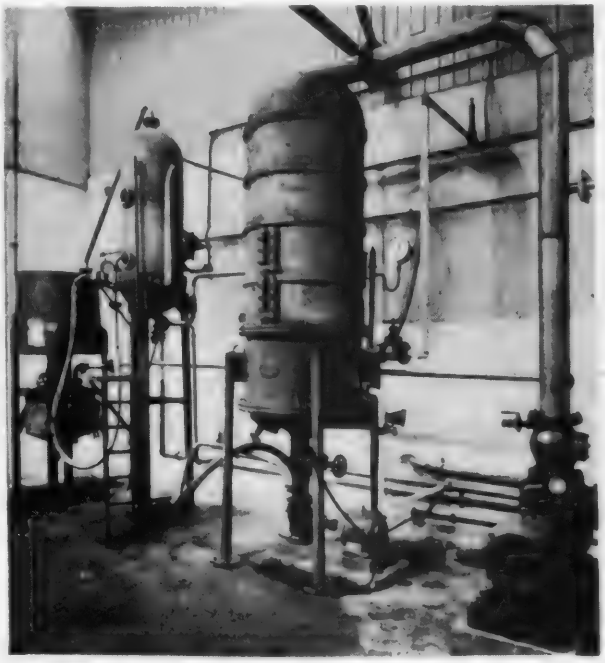
It became necessary in 1911 to seek larger premises and a factory was taken at North Road, Holloway; a limited company was formed two years later to take over the business. Shortly afterwards, the company began to produce essences for the bakery trade and, a little later, for the ice cream trade, in addition to their culinary essences. Sales of these new essences steadily grew and they now form a substantial part of the company's output.

Over the next ten years, business increased and larger sales created a need for even more factory space, so that, in 1930, it was decided to build new premises in a more open area. A two-acre site, bounded on three sides by public roads and on the fourth by a private works road, was purchased at Edmonton, just off the North Circular Road, and a modern, well lighted, ground floor factory was erected. Since these premises were built, it has been found necessary to expand them on three separate occasions and a fourth extension is now required.

After washing, the bottles are dried by hot air and conveyed to the filling machines.

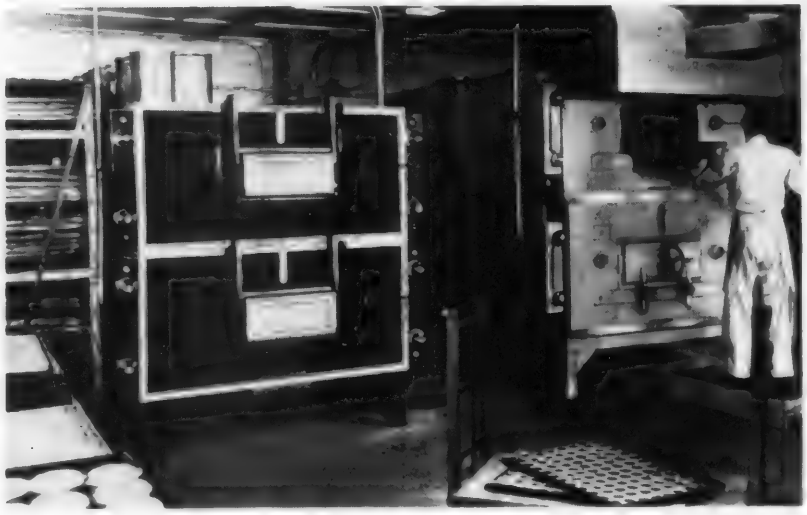
Essences still remain the company's chief production and, with the addition to their list of essences for the use of mineral water manufacturers, they comprise a very wide range of flavourings. Over 130 flavours are listed for bakery and confectionery use, while a further 100 are produced for mineral water manufacture.

This year the company celebrate their centenary, and they can look back with pride on one hundred years of steady development with extension of their production premises, establishment of research laboratories, ever-increasing sales, improvement in the quality of their products, and betterment of the working conditions and social amenities for their staff.



Part of the concentration plant which is used in the production of fruit juices.

Thousands of gallons of extract of the finest vanilla beans are slowly matured in oak vats.



Oliver and Gurden's bakery at Summertown.

Specialist Confectionery Bakery

One of the largest confectionery bakeries in the Oxford area is that of Oliver and Gurden, at Summertown; the business has made steady progress since its inception by two partners just after the 1914-18 war.

Baking was originally done by coke-fired ovens, but a change was soon made to oil-fired ovens. In 1936, the directors decided to experiment with a double-deck electric Peel oven. This new development was so successful that the same year three further ovens of this type were purchased.

In 1937, an electric travelling oven was also installed, and although during the war years it was modified to enable the oven to be used for bread baking, should that be necessary, it was found possible to continue using it for flour confectionery.

Post-war development brought about an ever-increasing demand and a further travelling oven similar to the first was installed in 1949, together with another double-deck oven.

In this bakery there are now ten Peel ovens which have an overall baking area of just under 320 sq. ft. The two travelling ovens are each 6 ft. wide and 35 ft. long; baking times are fully variable and the oven temperatures are automatically controlled. The whole of this equipment has been manufactured and supplied by The General Electric Co.

Changes of Address

On March 19 The Oppenheimer Casing Co. (U.K.) moved to more spacious accommodation at 159/165, Harrow Road, Paddington, W.2.

*

The Central Price Regulation Committee has now moved to Clive House (7th Floor), Petty France, London, S.W.1 (Telephone: Abbey 8010).

Obituary

Mr. William Hopwood, founder of W. Hopwood and Co., on February 20 at the age of 78.

Mr. Hopwood spent his early days with a firm of wood-engravers concerned mostly with engineering projects and, at the turn of the century, became increasingly impressed by the aggressive methods employed by American and German industrialists in this field to engage the graphic arts as part of their selling policy. Many guard-books hold items of sales literature, printed before 1914, which bear witness to his advanced views on the use of illustration with suitable typography. A clear and logical writer, he set a pattern for instruction books which has been extensively followed.

Of recent years he worked for a wider application of publicity methods to the marketing of engineering and allied products and services.

De La Rue Changes

In order to facilitate the operation of their industrial group, their wholly owned subsidiary company, De La Rue Extrusions, has been placed in voluntary liquidation and its assets and liabilities taken over by Thomas de la Rue and Co. The business will in future operate under the plastics division of the parent company.

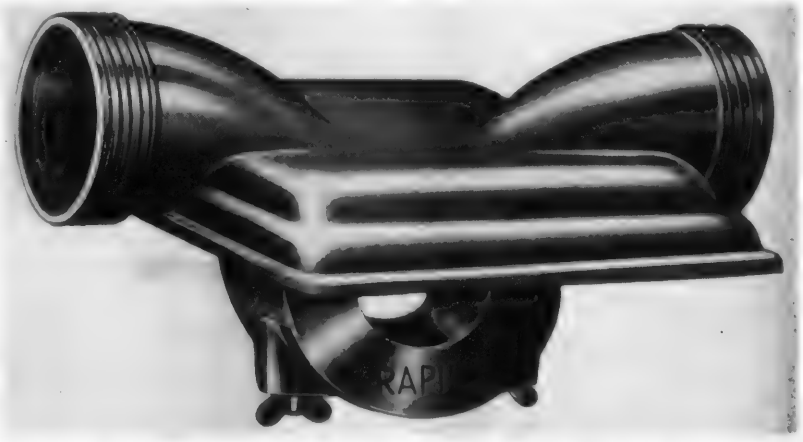
This change of status will in no way affect the continuity of the business and no change in personnel will be involved.

Eliminating Tramp Iron

Few food manufacturers underestimate the dangers inherent in the presence of "tramp iron"—ferrous particles or small pieces of metal, wire, nails, and the like—in their products. Specialists for 50 years in the production of magnetic equipment to overcome such dangers, Rapid Magnetic Machines manufacture a wide range of machines for the food and drink industry with techniques for every known purpose.

Permanent magnetic equipment is designed for treating items such as fruit juice, sauce, and other liquid or semi-liquid products. A plate type separator may be fitted to existing chutes or feed pipes to remove tramp iron from such commodities as custard powder, sugar, tea, and coffee. These separators are supplied in a large range of sizes to suit individual requirements, and incorporate permanent magnets of great strength; maintenance is negligible and no electrical connexions are required.

Drum type separators solve many tramp iron problems where the product is in the form of cubes or beans, *i.e.* raisins, currants. Another application is for the treatment of powder or granulated products if large quantities are being processed or the depth of feed is too great for the plate or chute type separator.



Permanent magnetic equipment for removal of "tramp iron" from fruit juices, purées, and sauces.

Tin Box Makers Close Factory

Owing to shortage of tinplate, Willowdale Metal Boxes, of Aberdeen, whose modern factory was opened on September 5 last, have announced their decision to close down.

Mr. George E. Sangster, joint managing director, stated recently: "Tinplate is not coming forward in sufficient quantities to keep us going. We are getting only about one-sixth of the amount we require."

Sales Management Examinations

Qualifying and final examinations in "Sales Management" will be held by The Incorporated Sales Managers' Association in London and a number of provincial centres on May 24, 25, and 26, 1951.

Entry forms, together with syllabus and regulations, may be obtained from the secretary of the Association, 4, Holborn Place, London, W.C.1. Closing date for entries will be April 30, 1951.

The practice of holding additional examinations in December of each year has ceased; annual examinations will, in future, be held in May or June.

Directory's Centennial

When Charles Mitchell initiated the Newspaper Press Directory in 1846, only 550 newspapers were published in the British Isles. The centennial issue, just published, records more than 5,000 British newspapers and periodicals, of which 1,254 are trade and technical journals, and nearly 8,000 publications are listed in the overseas section. Many house magazines are also recorded and, for the first time, a special section has been incorporated giving 968 directories and year books.

The new publishers have revised the typography, and the directory, which now appears in a new red cloth cover with gold lettering, is priced at £2 2s. The device used by Charles Mitchell, depicting Mercury stepping off from a printing press to encircle the world, remains.

The occasion was celebrated at Grosvenor House by a luncheon presided over by Sir Ernest Benn, Bt. The guests and speakers included Col. J. J. Astor, Lord Mackintosh of Halifax, and Mr. W. Leonard Hill.

Evaporators and Vacuum pumps

In the February issue of FOOD MANUFACTURE, The Mirrlees Watson Company were listed as one of the suppliers of evaporators and vacuum pumps to the Edme malt extract works. In actual fact, the company supplied part of the auxiliary machinery for the exaporating plant, the main plants being supplied by their associates, Blairs, Ltd.

Chocolate and Sugar Confectionery

CLASSES AT THE BOROUGH POLYTECHNIC

This year, for the first time, the City and Guilds Institute are holding an examination for the final certificate in cocoa, chocolate, and sugar confectionery. Students of sugar and chocolate confectionery at the Borough Polytechnic, who are now taking the fourth year course, will sit for the final examination in May.

Up to the present, courses have been planned for part-time day release students attending one day per week or for evening students attending two evenings per week. In September 1945, when the courses were begun, instruction was given on one day a week only, and it was not until September 1947, when a full-time instructor was appointed, that classes were given on five days and two evenings. At Easter 1949, a second full-time appointment was made to cover the science and raw materials sections of the syllabus. In consequence, it was possible to begin the senior course in September 1949 for the first time, and it is the students taking this who will be sitting for the final City and Guilds examinations in May.

It is now proposed to inaugurate a full-time course, to start in September 1951. The course is intended for those who will be taking up responsible positions in the industry and who are able to devote one or two years to full-time study.

Instruction will cover the production by hand and machine of most types of confectionery including boilings, toffee, chocolate work (including centres), jellies, starch work, fondants, pastes, aerated goods, and pan work. It will also include the scientific background, both general and specific, necessary for the full understanding of the properties of the raw materials used. The second year will include experimental confectionery and the balance of recipes. The organisation of a factory and a business, commercial relations, personnel and staff management, the Factory Acts, elements of accountancy, costing, marketing, and advertising are among the other subjects in the syllabus.

The first year of this full-time course should follow the lines of the two years' part-time intermediate City and Guilds course, with more emphasis on the technical training.

The second year of this course will cover more ground than the third and fourth years of the final City and Guilds course, so that students who complete it should have a good understanding of the sugar and chocolate confectionery industry and should be able to take up executive positions in that industry as soon as they gain the necessary commercial experience.

Applications for admission to this full-time course should be made as soon as convenient to the head of the National Bakery School, Borough Polytechnic, London, S.E.1. Further particulars of all classes in cocoa, chocolate, and sugar confectionery can be obtained on application.

Visits to U.S. Factories

An increasing number of United States factories are engaged on classified contracts for United States Government Departments.

Permission to visit these factories and to discuss unclassified material may be obtained through the Commercial Department of the British Embassy in Washington, who request such permits from the United States Government. As a first step, United Kingdom business men are asked to notify the Board of Trade, Commercial Relations and Exports Department (Industries Branch). When making requests for permits a clear month should be allowed between the time the British Embassy is first acquainted of the proposals and the dates of the visits to the factories.

Unless visitors are acting on behalf of a United Kingdom Government Department, permission to discuss classified material cannot be granted.

No permits are required for visits to firms not engaged on classified work for the United States Government, but it should be borne in mind that many firms specialising in engineering and other technical fields come within the classified category.

Industrial Electrification

Rotating electrical machinery, switch and control gear, static transformers, and rectifiers comprise the four principal products of The Electric Construction Co., founded in 1882.

The company manufacture a wide range of motors and generators, large and small, both ordinary industrial types and machines designed for specific purposes. Nearly all types of control apparatus to control D.C. and A.C. motors and generators, and switchgear of many other types, are made. Their transformers are supplied in all sizes up to 10,000 kVA or more, and rectifiers comprise both mercury-arc glass-bulb and metal-plate types. Consisting of a mercury-arc rectifier, a direct-current variable-speed motor, and control gear, the company's patent varispeed drive equipment gives efficient and economical results and greater speed range.

The opportunities offered at the firm's engineering works are dealt with in a booklet on training schemes for apprentices, intended for the guidance of those desirous of entering the electrical industry.

A Dexion-built conveyor.

Slotted Angle Construction

Utilising a world-patented system of slotting which ensures that, when two or three lengths of the angle are placed together to form a joint, all necessary bolt holes are instantly visible to take the nuts and bolts provided, Dexion slotted angle provides a quick, simple, and economical method of constructing a wide range of factory equipment.

Made of a special light alloy, the angle is put up in packets of 100 ft. and sold in lots of 200 ft. or more. It can be used for constructing items such as storage racks, conveyor frameworks, work benches, machine guards, laboratory equipment, and electrical switchgear mounting, without previous drilling or welding, thus effecting a great saving in labour.

The material has considerable possibilities in the building of experimental or permanent plant where no standard equipment is available to food manufacturers for their individual requirements.

Appointments

Mr. A. J. M. Harris, M.B.E., has been appointed manager of the publicity department of Shell Chemicals in succession to Mr. P. C. Drake, F.I.A.M.A., who is now undertaking special managerial work in the company's agricultural activities.

■

Mr. Stanley Waite, who has been with the firm since 1935, has been admitted into partnership with P. Samuelson and Co.

■

Mr. Frank W. Frost has been appointed managing director of the Kraft Cheese Company.

Joining the export department of the company in November 1929, he rose to the position of export manager in 1933. In 1937 he took charge of dairy specialities and animal feeding, and, at the same time, developed the sale of all bakery products. In 1939 he joined the London sales department as assistant manager.

Following five years' service in the R.A.F., he returned to the company in 1946 as London manager. In 1949 he was transferred to the head office as sales manager and was made sales director in 1950.

■

Dr. D. W. Kent-Jones has been appointed chairman of Procea Products in succession to the late Mr. Frank Rowlands.

Mr. L. D. Gammans, M.P., who joined the board of directors last July, has been appointed vice-chairman.

Food Group Dinner-Dance

The third annual dinner of the Food Group of the Society of Chemical Industry, which this year was held in association with the Agriculture Group, took place on March 8 at Grosvenor House, London.

After an excellent dinner had been enjoyed and the Loyal Toast, proposed by the Food Group chairman, Mr. A. L. Bacharach, had been honoured, the health of the Society of Chemical Industry was proposed by Sir Harold Tempany, chairman of the Agriculture Group. This was responded to by Mr. Stanley Robson, President of the Society, who gave an interesting account of its well-being and growth, and made special mention of the recent formation of the Microbiology Group, which had emerged from Panel status.

Mr. A. L. Bacharach proposed the toast of the remaining Groups of the Society, and Mr. N. C. Fraser, chairman of the Chemical Industry Group, responded.

After the room had been cleared for dancing, the floor was speedily filled, both juniors and seniors with their ladies joining in with unabated enjoyment until midnight.

Retirement

Mr. Harry H. Forbes, ice cream consumer sales manager of T. Wall and Sons, has retired after 25 years' service, and the company recently gave a dinner in his honour.

Joining Wall's in 1926, Mr. Forbes first became manager of the company's Croydon depot and was afterwards manager of the Beckenham and Battersea depots. He subsequently became sales supervisor in the London region and later assistant manager of the Acton and Croydon areas.

During the second world war, Mr. Forbes was in charge of the company's cold stores at Croydon, then being used by the Ministry of Food for storing South London's butter ration.

Self Service Stores

The number of stores adopting self service is rapidly increasing throughout the country. From large multiple stores to small, private groceries, this method of distribution has led to an increase in turnover, and reports show that in many cases profits have risen by as much as 50 to 70 per cent. in stores which have been converted from the traditional counter service.

The Self Service Development Association, who have organised an advisory bureau, recently showed two film strips which clearly illustrated the great importance of the layout of the self service store. At this meeting, the chairman stressed that the American idea of self service being restricted to the larger stores and becoming a vast super-market should be avoided, as reports had clearly shown the advantages experienced by the small shopkeeper.

It is essential in this type of distribution for goods to be displayed in classified groups and to be easily accessible to the customer. Packaging becomes of even greater importance in the self service stores, as much depends on the attractiveness and prominence of the packages. In many cases, all the food in these stores is prepacked, either by the manufacturers or the shopkeepers themselves. Transparent boxes and cartons that enable the actual contents to be displayed to the customer are used for most foods. The increased number of packed articles not only leads to a far higher standard of hygiene, but also enables such food as tomatoes, which previously have been sold from bulk, to bear the name of the suppliers on the package.

The difficulties which food rationing created in the self service store have been completely overcome in many cases by prepacking rationed goods and extracting the necessary coupons at the cash register where payment is made for the total purchases.

Fully Mechanised Choc Ice Production

A fully mechanised complete-flow production unit for chocolate ices is to be installed in the Seaward Street factory of the Scottish Co-operative Wholesale Society at Glasgow, which was opened some months ago to feed the growing chain of Co-operative stores in the West of Scotland.

The complete plant consists of a pasteuriser, homogeniser, cooler, and ageing vat unit of normal type feeding to a freezer and thence to an extruding tunnel. This is linked to a three-bar cutter and feeds the enrober which has a capacity of 120 gal. per hour. This enrober, in turn, feeds a wrapping unit, completing the entirely mechanised cycle of production.

"Green Arrow" Service Restored

As from March 1, 1951, the "Green Arrow" registered transits service for full wagonloads of freight traffic for export, except traffic to Ireland, has been restored by British Railways. The fee is 5s. per consignment in addition to the usual carriage charges.

Under this scheme a full consignment of goods is registered through to the port; every railway contact point *en route* receives an advance advice, by telephone or telegraph, of the consignment's passage, and a constant watch is maintained until the goods are finally delivered. The sender can also ascertain in advance when delivery can be effected.

Each consignment sent under this service is labelled with a "Green Arrow" label which identifies it throughout its journey.

Booklets Received

To the meat trader, an efficient, reliable refrigerator is of paramount importance, particularly while meat is in short supply. In their brochure *Prestcold Refrigeration for the Meat Trade*, the Pressed Steel Co. describe, with photographs of actual installations, their range of refrigeration equipment, including cold rooms, cooling units, service cabinets, display counters, and multi-compartment installations, for this branch of the food industry.

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In addition to the personal news items, articles on the kippering of herring, a walrus hunt, and products of the company on show at recent exhibitions help to make the winter issue of *Maconochie Magazine* particularly interesting.

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An insight into all the different branches of their work is provided by a recent issue of the *F.M.S. Bulletin*. Articles cover the subjects of dehydration, an advisory service for poultry farmers inaugurated by the company, sales organisation, an experimental calf feeding unit, and a new milk substitute. Various area reports and news from overseas are also included.

▪

In the foreword to the 1951 issue of *The Host Holbrook Bulletin* it is stated that, despite contraction of premises, 1950 proved to be a record year for output. Some 10,000 new accounts have been opened in the U.K. and there has been considerable development in the wholesale trade. A New Zealand and a South African company were registered and production has started in both factory premises.

During the year two new products, mint sauce and a non-alcoholic tomato juice cocktail, were added to the range, and tomato ketchup has been reintroduced.

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Poultry keepers interested in the battery system will find many useful facts and figures on the subject in the 52-page booklet *Laying Batteries*, issued recently by the Shell BP Farm Service. The book is compiled by Ray Feltwell, N.D.P., and is one of a series of booklets under the general editorship of H. Temperton, D.Sc., N.D.A., N.D.P.

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With the aim of emphasising how much specialist knowledge is necessary for the design and manufacture of steel pallets, Fisher and Ludlow, in a recent issue of their publication *Flow*, show by means of a series of photographs all the stages in the manufacture of this equipment, from the receipt of an order to the delivery of the finished article.

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Details of water insoluble adhesives for food containers made, under a Swiss patent, from casein combined with certain chemicals, and the addition of specified antiseptics to starch pastes to prevent putrefaction, are given in a recent issue of *Packaging Abstracts*.

Other items deal with a method of bonding the side seams of can bodies; making symmetrical spherical capsules; and the packaging of cake and pie mixtures, loose-flowing contents, macaroni (without crumbling it), wine and fruit juice, live lobsters (which remain alive under refrigeration for up to four days), sundae-topped ice cream, and mushrooms (allowing for transpiration, respiration, and growth in the package).

Company News

A second interim dividend of 19 per cent., less tax, on the deferred shares of the company in respect of the year ending March 31, 1951, has been announced by the directors of the Beecham Group. This dividend brings the total distribution to date on these shares to 36 per cent., less tax.

OBITER DICTA

- A price control on rabbits would drive them into "underground channels."—*Mr. Maurice Webb, Minister of Food.*
- There is not better food served or prepared anywhere than in British homes.—*Mr. A. G. Bottomley, Secretary for Overseas Trade.*
- If only some of the £80 million thrown away on the groundnut scheme had been devoted to British agriculture, there would have been no meat shortage today.—*Mr. George Lambert, M.P.*
- The means of prevention of food poisoning are, however, within our grasp, provided we have a nation-wide concerted effort directed to all forms of "shopping bags," national and domestic.—*Dr. F. C. Hamilton.*
- It is no use filling my husband with statistics when he comes home for dinner. He wants to see a meal on the table.—*Housewife at a meeting of the Nottingham and Notts. Housewives' Association.*
- Attlee, you can't starve housewives into submission. Stop trying. Empty pates have given us empty grates and empty plates—resign.—*Mrs. Carrington Wood, national secretary to the National Federation of Housewives.*
- Let's stop all this grumbling about the food situation, and face it sensibly for a change. Let us recognise that our complaints do not arise because we are hungry, but because we are greedy. We have not been hungry, and we are not going to be hungry. There is and will be an ample supply of what we need, though there may be a limited supply of some of the things we want.—*Rev. A. H. Kirkby, writing in the "Illustrated Leicester Chronicle."*
- To say that almost all deaths from a disease virtually unknown before the introduction of artificial foods occur in babies taking such foods, and then to look elsewhere for the explanation, seems surprisingly akin to suggesting that when a baby left out in the rain gets wet, it is not the rain that is wetting it, but some unknown constituent the rain picks up on its way from the clouds. To most people the obvious thing to do would be to take the baby out of the rain first, before wasting time looking for the likely bug.—*"Whole Food."*

World Food News

Canadian Trade Fair

The 1951 Canadian International Trade Fair is to be held at Toronto from May 28 to June 8.

Several British trade associations are organising group displays of the products of their member-firms. To date, applications for space received from U.K. manufacturers total well over 60,000 square feet.

Container Exhibition at Zurich

Arranged by the Swiss Federal Railways on behalf of the Association of Traffic Experts of Switzerland, an International Container Exhibition is to be held at Zurich Tiefenbrunnen Station from April 14 to 23.

British Railways, who operate the largest number of containers of any European railway and have some 22,000 containers of different varieties in use, are to exhibit six types, including a highly insulated container for quick-frozen foods and refrigerated goods, and an insulated type fitted with hooks and bars for such commodities as frozen and chilled meat and fish.

French Fish Canning Bulletin

The methods used in the preparation of canned tunny, herring, and Californian pilchards, which alone are of interest to the French fish canning industry, are described in a bulletin by M. Henri Cheftel, director of the research laboratory of *J.J. Carnaud et Forges de Basse-Indre*. Entitled *La Préparation des Conserves de Poisson aux États-Unis*, the bulletin is fully illustrated with diagrams of layouts and photographs of machinery used in the U.S.A. and concludes with a brief account of certain special products such as fish flakes, herring roes, crustaceans, and shelled fish.

No detailed description is given for the canning of salmon, despite its importance in the U.S.A., in view of the fact that the fish is rare in France and its canning cannot therefore be considered in the latter country.

Sweetening of S. African Foods

It has been decreed by the South African Government that no manufacturer shall sell any food containing saccharin, dulcin, or other synthetic sweetening substance except in the case of foodstuffs intended for persons suffering from diabetes or some other similar disease. In such cases the nature and proportion of sweetening substances must be stated on the label.

It is also prescribed that in future fruit syrups, cordials, and squashes shall be prepared with the juices of sound fruit or fruits, clean potable water, and sugar (sucrose), with or without the addition of citric or tartaric acid or vinegar and permitted colouring matter. They shall not contain less than 20 per cent. of fruit juice and 25 per cent. of sugar (sucrose) and shall not contain any flavouring substance other than that naturally present in the fruit or fruits from which they have been prepared, nor any other foreign substance except glycerin or a permitted preservative or colouring substance.

India's Canned Fruit Industry

India's preserved fruits industry, sheltered by tariff protection and enjoying the advantages of drastic import control, is struggling to establish itself. The industry now produces canned and bottled fruits, fruit juices and squashes, jams, jellies, and marmalades as well as candied and crystallised fruits. The number of fruit canning establishments in the country increased from 295 at the end of 1948 to 449 at the end of 1950. The Ministry of Agriculture estimates that the total production of canned fruits and vegetables in the licensed factories in 1950 was about 6,700 tons; of this preserved fruits formed about 50 per cent.

The defence departments purchase all their requirements of preserved fruits from the Indian industry, amounting to 22 per cent. of its entire output. As regards fruit squashes and juices, forming 70 per cent. of the entire output of the industry, the country is not only self-sufficient, but has a surplus for export.

S. Africa Food Colour Laws

New South African regulations prohibit the use of any colouring matters for foods, other than cochineal, caramel, chlorophyll, annatto, saffron, all harmless vegetable colouring substances, and certain specified pure synthetic colouring substances or blends thereof.

It is further provided that, where colouring substances are used, these should be of the highest standard of purity.

Manufacturers of foodstuffs are also required to disclose to inspectors the name of the colouring that has been used in their products.

Irish Jam Industry

DIFFICULTIES FACING MANUFACTURERS

When jam manufacturers sought a price revision from the newly constituted Prices Advisory Body in Ireland, they told of the difficulties with which this important Irish food industry was faced, declaring that the previous price revision (prices for jams and marmalades were fixed in Ireland on February 12, 1949) had caused a decline in the output of factories of about 16 per cent. in 1949—a decline which had persisted during the spring of 1950.

Although the Minister for Industry and Commerce had been asked to reduce the prices of raw materials, especially sugar and jars, he had instead on October 3, 1950, sanctioned an increase of 1d. per lb. for sugar and had made no provision by which the industry might meet this big increase in its principal raw material. In spite of the fact that the price was eventually reduced by a ½d. per lb., no increase in the prices of jams and marmalades to offset the increased price of sugar had been recommended.

The Prices Advisory Body were told that coal prices had increased by 71 per cent., carriage by 17 per cent., cartons by 10 per cent., and metal vacuum caps by 200 per cent. since the last increase in the price of jam.

Mr. James J. Holloway, of J. J. Holloway and Sons, stated that a reduction in the price of sugar might be the best solution, but that if there were to be increases in the prices of jams then such increases should apply only to "straight lines" such as raspberry, strawberry, and blackcurrant, the cheaper mixed lines being left alone.

It appeared that three courses of action faced the industry: firstly, they could manufacture jams and marmalades without profit, obviously an unacceptable position; secondly, prices could be increased, moneys paid out in excess of 65s. 4d. per cwt. on sugar purchased since October 3, 1950, being refunded; and thirdly, the course which the Jam Manufacturers' Association preferred, there might be no change in jam and marmalade prices, but recognised manufacturers who delivered products throughout Ireland should receive their sugar at 65s. 4d. per cwt. as from October 3 last.

It appeared that, although fruit pulp was cheaper last year, less was imported into Ireland, and manufacturers there had to use high-priced home-grown fruit instead.

Customs Co-operation Conventions

The British Ambassador in Brussels has signed, on behalf of the United Kingdom, three international Conventions for promoting uniformity and harmony in Customs procedures.

The Conventions, which have already been signed by six other European countries, have a technical scope. The first provides for the adoption by participating countries of a common classification of goods for their Customs tariffs, and the second for a common definition of value, framed in general conformity with the United Kingdom valuation system, as a basis for Customs duties. For the United Kingdom this will result in a more systematic tariff classification.

The third Convention sets up a Customs Co-operation Council whose task will be to maintain the uniform application of the two technical Conventions, and generally to further co-operation between adhering countries in Customs matters.

These Conventions result from the technical work of the representatives of the sixteen European countries forming the Customs Union Study Group which has been working in Brussels, but they are not restricted to European participation.

Irish Produce Chocolate Crumb

Production of chocolate crumb on an experimental basis has started at a new factory at Carrick-on-Suir, Ireland.

OVERSEAS ENQUIRIES

Vermicelli Products

The United Kingdom Trade Commissioner at Hong Kong has reported that Alexandra James and Co., Bank of East Asia Building, Hong Kong, are desirous of contacting United Kingdom suppliers of vermicelli products.

Firms interested in this enquiry should forward quotations direct to the company.

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Canned Salmon and Asparagus

The United Kingdom Trade Commissioner in Queensland has reported that The Great Northern Trading Company of Australasia Chambers, 406, Queen Street, Brisbane, desire to obtain supplies of canned red salmon and canned asparagus, either sticks or tips, from the United Kingdom.

Firms interested in this enquiry should forward quotations direct to the company.

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Canned Fish and Biscuits

The United Kingdom Trade Commissioner in Queensland has reported that Sanders Chemical, Ltd., of 148, Mary Street, Brisbane, a firm of manufacturing chemists and general merchants, are about to enter the food business and intend to set up a chain of food stores with the trade mark of "Super Market" in Queensland and other Australian States. In addition to their selling offices in every city in the Commonwealth they are embarking on a wholesale van service calling on suburban stores.

The company desire to obtain from the United Kingdom foodstuffs which they can sell directly through their chain of stores or through their wholesale van service; they are particularly interested in canned herring, both fresh and in tomato sauce; canned kippers, kipper snacks, and pilchards; and some form of dried cod. They would also like to obtain an agency for a United Kingdom firm of biscuit manufacturers.

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Fruit Juice Mixers

It has been reported by the United Kingdom Trade Commissioner at Kingston that Mr. James F. Gore, Standard Works, Waterloo Road, Half-Way Tree, Jamaica, is interested in purchasing electric mixers for fruit juices.

Interested United Kingdom manufacturers are invited to write direct to Mr. Gore giving full information about their products and enclosing any available literature.

Fruit and Vegetable Congress

The second European and Mediterranean Joint Congress of Fruits and Vegetables, organised by the *Union Nationale Interprofessionnelle des Fruits et Légumes*, is to be held in Paris from April 24 to 29, 1951. Applications for participation in the Congress should be sent to the Organising Committee, 8, rue Turbigo, Paris, 1.

News from the Ministries

Exchange Control Concession

From March 3, 1951, Form C.D. 3 (Currency Declaration) for goods exported for exhibition at trade fairs abroad will no longer require Bank of England approval prior to shipment, provided that a statement is included on the form and on the pre-entry documents embodying the name of the trade fair, the quantity, value, and description of the goods, and an assurance that they are being shipped to secure export orders and will be returned or paid for in an approved manner within six months of shipment.

This concession does not extend to pictures, antiques, or other valuables, unless they form an integral part of the exporter's exhibit and are covered, where necessary, by an export licence.

Dried Peas Imports

The individual licensing of imports of edible dried green peas will be continued for a further year from July 1, 1951, to June 30, 1952.

Approved Cleansing Agents

Approval has recently been given by the Minister of Food and the Minister of Agriculture and Fisheries under the Milk and Dairies Regulations, 1949, for the use of the following sodium hypochlorite solutions for the cleansing of dairy utensils, in addition to those already approved: Duros (The Ocean Chemical Co.); Solchlor (Solwhite Chemical Co.); and Gascoigne Red Label (Gascoignes (Reading)).

Marking of Imported Foodstuffs

Imported currants, sultanas, raisins, bacon and ham, poultry, meat, and butter will require to be marked with an indication of origin as from May 25, 1951, when the Marking Orders applicable to those products, made under the Merchandise Marks Act, 1926, again become operative. Similar Orders are already in operation in respect of imported fresh apples, eggs, oat products, tomatoes, margarine, malt products, frozen or chilled salmon or trout, and honey.

Details of the marking requirements are set out in Notice 33C, copies of which can be obtained from the Ministry of Agriculture and Fisheries, 14/21, Chester Terrace, London, N.W.1; The Department of Agriculture for Scotland, St. Andrew's House, Edinburgh, 1; or The Ministry of Agriculture for Northern Ireland, Stormont, Belfast.

Appointments

The Rt. Hon. the Earl of Listowel, Parliamentary Secretary to the Ministry of Agriculture and Fisheries, has appointed Mr. E. D. Hardy to be his private secretary.

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Mr. L. J. Smith, Principal, Ministry of Agriculture and Fisheries, has been appointed secretary to the Agricultural Land Commission.

Change of Address

The White Fish Authority have opened permanent headquarters at Conyngham Hall, Knaresborough, Yorkshire (Telephone: Knaresborough 2217).

Old Potato Stocks

Except for a very small emergency reserve, the Ministry of Food is not holding stocks of old potatoes this season for use in May, June, and July. Wholesalers who require old potatoes in those months to supply fish friers and other customers should therefore make their own arrangements with their suppliers for the retention of sufficient potatoes to meet their needs.

Home-grown Linseed

When the revocation of the Home-grown Linseed (Control) Order, 1948, was announced on January 18 last, it was stated that the Ministry of Food would be willing to buy home-grown linseed after June 30, 1951, at prices related to those which it would at the time be prepared to pay for imported linseed or linseed oil.

So that farmers may have some idea what price their 1951 crop will realise, the Ministry of Food now announces that it will guarantee a minimum price of £65 a ton ex-farm for home-grown linseed of 90 per cent. purity delivered during the year July 1951 to June 1952. Actual buying prices, which may be above but will not be below the minimum, will be published from time to time from July onwards. Appropriate adjustments will be made for seed of greater or less purity.

Farmers are reminded that feeding-stuffs coupons will not be issued against sales of home-grown linseed after June 30, 1951.

Milk Powder in Sausages

The Meat Products and Canned Meat (Control and Maximum Prices) Order, 1948, has been further amended, following a request from manufacturers to be allowed to include a limited proportion of milk powder in pork and beef sausages. The practice of including milk powder in meat products ceased during the war because of the shortage of milk, but its use now will help to offset the effect on production of sausages of the reduced amount of meat now available for manufacturing purposes.

Under the new Order, milk powder may be used in substitution for meat in the proportion of 3 parts of milk to 5 parts of meat, provided that the meat content of pork sausages, pork sausage meat, and pork slicing sausage does not fall below 55 per cent. and the meat content of beef sausages, beef sausage meat, and beef slicing sausage below 40 per cent. The existing requirement that 80 per cent. of the meat content of pork sausages must consist of pork remains in force. The prices of sausages and sausage meat will not be affected.

The new Order came into force on March 4, 1951.

More Unrestricted Imports

Cocoa butter and natural or artificial bladders and casings may be imported without restriction from the usual "liberalisation" list of countries. Importers of natural bladders and casings are reminded that they may not be imported for sale in the United Kingdom unless accompanied by an official certificate under the Public Health (Imported Food) Regulations, 1937/48.

These unrestricted imports are permitted from all countries other than Albania, Argentina, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian Zone), Guatemala, Haiti, Honduras, Hungary, Persia (Iran), Japan, Korea, Liberia, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Tangier, Union of Soviet Socialist Republics, United States of America, Venezuela, Yugoslavia.

Open General Licence Extensions

The open general licence referred to in Notice to Importers No. 401, Appendix II, has now been extended to include many new items which are consigned from and originate in any country or territory other than Albania, Argentina, Bolivia, Bulgaria, Canada, Colombia, Costa Rica, Cuba, Czechoslovakia, Dominican Republic, Ecuador, El Salvador, French Somaliland, Germany (Russian Zone), Guatemala, Haiti, Honduras, Hungary, Persia (Iran), Japan, Korea, Liberia, Mexico, Nicaragua, Panama, Philippines, Poland, Roumania, Tangier, Union of Soviet Socialist Republics, United States of America, Venezuela, Yugoslavia.

From the same date, a number of changes in the existing list of open general licence articles have been made.

The open general licence relates to goods consigned from and originating in any of the permitted sources; thus, goods consigned from one of the permitted countries and originating in another permitted country are covered, but not goods originating in any of the excepted countries even if consigned from one of the permitted countries.

Wherever it is proposed to import from one country goods originating in another, the Exchange Control Authorities should be consulted, through the medium of the importer's bankers, before any commitments are entered into.

Importers are reminded that the issue of an open general licence does not relieve traders from complying with other regulations to which certain goods are subject. In their own interests traders should make enquiries of the local officer of H.M. Customs and Excise about such regulations before arranging importation.

Macaroni Exports Freed

In a letter sent to the Food Manufacturers' Federation by the Cereals Division of the Ministry of Food about the liberalisation of external trade in macaroni and similar products, it is stated that it has been decided to remove the existing restrictions on the export of these products from the United Kingdom forthwith. It will still be necessary, however, to retain the export licensing procedure.

In view of the obligations of the United Kingdom as respects the liberalisation of inter-European trade, the letter states that it is now necessary to grant corresponding freedom in respect of imports of macaroni and similar products into the United Kingdom. Such imports will accordingly be permitted from non-dollar sources.

New Zealand Meat Prices

As a result of a review of prices carried out in accordance with the terms of the meat contract between the United Kingdom and New Zealand, it has been agreed that the prices to be paid for some kinds of meat from New Zealand during the contract year October 1, 1950, to September 30, 1951, will be increased. The increases will be equivalent to an average increase on all meat of approximately 5½ per cent. above those ruling during the previous contract year.

Under the seven-year agreement made in 1948, the Ministry of Food undertook to buy the whole of New Zealand's exportable surplus of meat until 1955, at prices which are subject to annual review, with maximum variations in any year of 7½ per cent. above or below the price for the preceding year.

Bread Control and Prices

An Order has been made replacing and consolidating, with amendments, the Bread (Control and Maximum Prices) Order, 1947, as amended.

The principal changes effected by the new Order, which came into force on February 18, 1951, are:

(*a*) Wrapped sliced bread is included in the definition of "loaf" and must therefore be made up in weights to which loaves have to conform under the Order.

(*b*) Licences to manufacture bread are no longer needed.

(*c*) The sale of loaves weighing 2 oz. or less is allowed, and such loaves may be sold free of price control.

(*d*) The maximum price of pan loaves manufactured in Scotland is increased by ½d. for each 14 oz.

(*e*) A new brand of gluten bread has been added to the list of breads that can be sold free of price control.

Information and Advice

Manufacture of Nonpareils

B.4946. *We are anxious to obtain full details regarding the manufacture of nonpareils, and should be obliged if you could help us in this connexion.* (Lancs.)

One to 1½ cwt. of well-dried and sifted granulated sugar is placed in a steam-heated dragée pan. The sugar is warmed and maintained at a gentle heat throughout the process. A liberal charge of 26° Baumé syrup is poured over the sugar in motion, and the hand run through the mass to distribute the syrup evenly, sprinkling with a scoop of warm corn starch. The mass is well agitated with the hand. This process is repeated until the grains begin to take form. At this stage, 30° Baumé syrup and corn starch are added for several successive charges.

The process is repeated with 35° Baumé syrup and corn starch until the grains have increased nearly sufficiently. Finally, charges of 35° Baumé syrup alone are added. Each coating is allowed to dust before adding the next charge of syrup.

Finishing is accomplished by adding four or five charges of syrup at 32° Baumé, to which are added the desired colourings.

Ice Cream Wafers

B.4978. *We should be glad if you would let us have a recipe for manufacturing ice cream wafers.* (South Africa.)

The following recipe is given as a basis for trial:

Flour	75 lb.
Water	130-140 lb.
Milk powder	2·5 lb.
Malt extract	6 oz.
Melted cocoa butter	1·75 lb.
Bicarbonate of soda	4 oz.
Bicarbonate ammonia	2 oz.
Egg yellow colour	4 oz.
Carmine colour	2 oz.

The flour, milk powder, malt extract, and melted cocoa butter are mixed for five minutes. The water is added in three or four lots and the whole is beaten thoroughly for a total of fifteen minutes.

The soda, ammonia, and colour are added at the last minute. The mixture is then strained and cooked in the wafer machine.

Jam Manufacture

B.4987. *Is there any product that can be used to replace citric and tartaric acid in jam manufacture?* (Northern Ireland.)

In the manufacture of jam, 80 per cent. lactic acid can be used in the place of citric or tartaric acid.

Ten g. of citric acid are equivalent to 16 g. of lactic acid, and 10 g. of tartaric acid are equivalent to 15 g. of lactic acid.

Praline Base

B.4993. *We should be glad if you could let us have a recipe for praline base.* (London.)

Praline, based on the combination of finely ground nuts, boiled sugar, and varied flavouring, makes a popular chocolate centre, or truffle. The confection known as truffle usually has a praline centre, which is dipped in chocolate and rolled in cocoa or chocolate powder, or chocolate vermicelli, while the chocolate is still plastic. High-class truffles contain spirits and liqueurs, which blend admirably with the basic ingredients to form a delightful confection.

The following recipe for praline base is suggested as a basis for trial:

	lb.
White sugar	56
Blanched almonds	28
Blanched hazelnuts	28

The almonds and hazelnuts are roasted at 295° F. The sugar, with sufficient water, is placed in a small steam pan or gas-heated pan, heated and stirred until the sugar is completely dissolved. The roasted nuts are added and cooked to 315° F. The cooked nuts are poured on a water-cooled slab, and, when cold, broken up, placed in a melangeur for pulverising, and passed through the refiner.

Using this paste as a base, any suitable flavouring and other ingredients, such as ground dry fruits, cacao liquor, chopped nuts, etc., may be added to provide an interesting range of candies.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.4947. *Candied peel.* (Holland.)
B.4948. *Chocolate couverture.* (Yorks.)
B.4949. *Canning of processed peas.* (London.)
B.4952. *Centrifuge super-glassware.* (Sweden.)
B.4953. *Antiseptic detergent.* (Yorks.)
B.4954. *Cold mix ice cream powder.* (Argentina.)
B.4956. *Bundling machine.* (Lancs.)
B.4958. *Continuous pressure cooker-coolers, and temperature control.* (Finland.)
B.4959. *Blanching, grading, and drying of almonds.* (Surrey.)
B.4960. *Brewing plant.* (Portuguese East Africa.)
B.4962. *Roasting and dehydration plants.* (London.)
B.4973. *Fish waste.* (Holland.)
B.4974. *Cheese and potato straws.* (Canada.)
B.4975. *Chocolate melting and dipping.* (Lancs.)
B.4976. *Labelling oval cans.* (Holland.)
B.4977. *Clarification of frying oil.* (Lancs.)
B.4979. *Moisture determination.* (Australia.)
B.4980. *Filling machine for marmalade.* (Herts.)
B.4982. *Plastic package for vegetables.* (London.)
B.4984 *Manufacture of doughnuts.* (London.)
B.4986. *Sweet manufacture.* (Middx.)
B.4989. *Worcester sauce.* (London.)
B.4990. *Glyceryl monostearate; lactose; fondant and marzipan; sweetened fat; cherries; solid pack apples; gelatin; desiccated coconut; cornflour; potato powder; chocolate vermicelli.* (Lancs.)
B.4994. *Pickled mussels.* (Co. Durham.)
B.4996. *Dicing machine.* (Lancs.)
B.4998. *Sauerkraut.* (Australia.)
B.5001. *Sweetening compound.* (Lancs.)
B.5002. *Synthetic cream.* (U.S.A.)
B.5003. *Milk separators.* (Yorks.)
B.5004. *Glass containers.* (Leics.)
B.5005. *Automatic heat sealers.* (London.)
B.5008. *Outside can lacquering machines.* (Warwicks.)
B.5010. *Antibiotics as preservatives.* (Kent.)
B.5013. *Butter blending.* (Scotland.)
B.5015. *Manufacture of table jellies.* (London.)
B.5017. *Insulated fibreboard containers.* (Yorks.)

Recent Patents

648,154. GRONBERG, A. B.: Grain grinding mills.

648,885. ALBRIGHT AND WILSON, LTD.: Milk products and the manufacture thereof.

648,886. GOODRICH CO., B. F.: Amides and/or amino acids.

648,905. NAAMLOOZE VENNOOTSCHAP CENTRALE SUIKER MAATSCHAPPIJ: Process for the production of sugar-containing juices from vegetable materials.

648,921. CARLSON, R. C.: Boxes, drums, and like containers.

648,956. JACKSON AND CROCKATT, LTD., J. G., and GAIR, D.: Machines for filling receptacles with powder, paste, or the like.

649,036. GRAHAM-ENOCK MANUFACTURING CO., LTD., and ENOCK, A. GRAHAM-: Machines for filling and capping bottles and like containers.

Abstract of a Recent Specification

Printing Can Surfaces

This invention relates to machines for printing or marking the surfaces of cans and similar articles with names, numbers, letters, dates, and the like, and it has special reference to machines intended for printing code, date, and like canners' markings upon the ends of food-containing cans used in the canning industry. The invention could, however, be employed for printing or marking similar articles or cans other than food-containing cans.

The object is to provide a machine for printing or marking cans and other similar articles which is entirely automatic in action and which will ensure the efficient marking of a succession of articles in a quick and reliable manner without recourse to handling.

Such a machine for printing or marking the surfaces of cans and other similar articles comprises a wheel or rotary carrier having pockets or recesses therein for receiving articles in succession, means for intermittently operating the wheel or carrier to bring each successive article to rest in a predetermined printing or marking position, and printing means operated automatically each time the wheel or carrier is brought to rest in order to impress the desired marking upon the article which is in the printing or marking position.

The machine comprises a main driving shaft, means operated from the driving shaft for rotating the wheel or carrier step by step, an ink distribution roller driven from the driving shaft, a type element carried by a movable member operated from the driving shaft in timed relation to the wheel or carrier so as to be moved towards and away from the wheel or carrier when the latter is stationary, in order to imprint an article in the printing or marking position, and a type-inking member adapted to contact the ink distribution roller and to be moved across the face of the type element when the latter is retracted from the wheel or carrier. The member carrying the type element and the type-inking member may be operated by cams.

645,677. *James Alfred Webb and Thomas Burns.*

Recent patents have been selected from the "Official Journal of Patents" and are published by permission of the Controller of H.M.S.O.

Trade Marks

FARHOL.—685,466. Potato starch for food, and farinaceous foods. **Naamlooze Vennootschap W. A. Scholten's Aardappelmeelfabrieken** (a Limited Liability Company organised and existing under the laws of the Kingdom of the Netherlands), Emmaplein 6, Groningen, Holland; Manufacturers and Merchants.

FOAMADEX.—686,141. Albuminous substances for use in food and drink manufacturing processes. **Mars, Limited,** Dundee Road, Slough, Buckinghamshire; Manufacturers.

FLAVOLAIT. — 687,128. Flavourings (other than essential oils). **The Birmingham Chemical Company, Limited,** "Wiltell" Works, St. John Street, Lichfield, Stafford; Manufacturing Chemists.

MAID MARIAN.—688,159. Flavourings (other than essential oils) for foods and beverages. **Danish Bacon Company, Limited,** 9-13, Cowcross Street, London, E.C.1; Wholesale Provision Merchants.

VELVA-FRUIT.—688,313. Iced confections made with fruit, fruit pulp, and fruit juices. **Adrian Hayes (Importers), Limited,** 20, Grosvenor Gardens, London, S.W.1; Merchants and Processors.

CASILAN.—688,416. Infants' and invalids' foods, all containing calcium caseinate. **Glaxo Laboratories, Limited,** 891-995, Greenford Road, Middlesex; Manufacturing Chemists.

CRE-LITE.—688,488. Artificial cream (for food). **A. Goldrei and Company, Limited,** 116, Southwark Street, London, S.E.1; Manufacturers and Merchants.

ENSOLAC.—688,825. Food preparations containing milk as an ingredient. **Benger's, Limited,** Harvest House, Ipswich, Suffolk, and Holmes Chapel, Cheshire; Manufacturers.

PEDIGREE.—688,829. Refrigerators, refrigerating apparatus, and refrigerating installations; and cabinets, chambers, and chests, all being parts of refrigerators. **Ewing and Davies Joinery, Limited,** Chertsey Road, Byfleet, Surrey; Manufacturers.

SUNPRIDE.—688,954. Canned fruit. **R. Phillips and Son, Limited,** 2-4, Potters Fields, Tooley Street, London, S.E.1; Importers and Merchants.

KENTVUE.—689,309. Fresh fruits and fresh vegetables. **J. D. and A. J. Large, Limited,** Cherry Gardens, Goudhurst, Kent; Merchants.

BUFFALO.—689,359. Canned fruits and canned vegetables. **Celestino Trigo Societa Anonima** (a *Societa Anonima* organised under the laws of Spain), Plas Marques de Estella 5, Valencia, Spain; Merchants.

OSSORY.—690,209. Preserved vegetables, preserved fruits, preserved meats, and preserved fish. **Irish Canners, Limited** (a Company incorporated under the laws of the Irish Republic), 1-3, Westmoreland Street, Dublin, Irish Republic; Food Canners and Packers.

NECTONA.—690,241. Honey. **Thornton and Ross, Limited,** The Chemical Works, off Manchester Road, Linthwaite, Huddersfield, Yorkshire; Manufacturing Chemists.

SHEIK.—690,604. Sweet pickles. **Joseph Kat,** trading as **The Premier Pickle Company,** 37, Holly Street, Dalston, London, E.8; Manufacturer and Merchant.

Trade marks have been selected from the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

New Companies

Haven Packaging, Limited. (490034.) 29, Corsica Street, Highbury, N.5. To carry on business of manufacturers of and dealers in folding, rigid, or other boxes, containers, etc. Nom. cap.: £100 in £1 shares. Dirs.: Rosa L. Shirley, 86, Aberdeen Park, Highbury, N.5 (permt. gov. dir.); H. F. Ray, 116, Gallants Farm Road, East Barnet, Herts; Marion W. Mason, 17, Aynhoe Road, Brook Green, W.14.

Eric Foods, Limited. (490057.) 203, Regent Street, W.1. To carry on business of exporters, importers, wholesalers, and retailers of food produce, general continental produce, and alimentary articles, etc. Nom. cap.: £100 in £1 shares. Dir.: E. Bachner. Subs.: Eileen M. Tew, 2, Parkway Court, Ruislip, Middx. (clk.); G. Lee, 23, Larkhall Rise, Clapham North, S.W.14 (commissionaire).

Patz Products, Limited. (490129.) 11A, The Spot, Derby. To carry on business of manufacturers of and dealers in confectionery, ice cream, biscuits, chocolates etc. Nom. cap.: £2,000 in £1 shares. Dir.: J. T. Slater, 140, Radbourne Street, Derby.

John Garvey, Limited. (490158.) 1, Craven Passage, Craven Street, Strand, W.C.2. To carry on business of grocers, greengrocers, tobacconists, and caterers, etc. Nom. cap.: £3,000 in £1 shares. Dirs.: J. K. Garvey and Iris L. Garvey, 1, Craven Passage, Craven Street, Strand, W.C.2.

J. Sheekey, Limited. (490245.) 19, St. Martin's Court, W.C.1. To take over and carry into effect an agreement with Emily M. Williams, and to carry on business of restaurant keepers, licensed victuallers, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: Emily M. Williams (permt. gov. dir.) and S. Williams, 87, Bedford Court Mansions, W.C.; Mrs. P. M. Dalton, 4, West Hill Court, Millfield Lane, N.6.

Pomson (Packaging), Limited. (490257.) 137, Mile End Road, E.1. To carry on business of manufacturers of and dealers in cartons, boxes, tubes, cases, bags, made of foil, Cellophane, paper, etc. Nom. cap.: £100 in £1 shares. Dirs.: To be appointed by subs. Subs.: H. L. Moreton, 75, Townshend Court, St. John's Wood, N.W.8 (acct.); L. H. Cohen, 30, Wellesley Court, Maida Vale, W.9 (acct.).

A. Coulson and Sons, Limited. (490308.) 5, Grove Street, Wantage, Berks. To carry on business of grocers, provision merchants, etc. Nom. cap.: £6,000 in £1 shares. Dirs.: A. E. E. Coulson; Lily Coulson; K. E. Coulson; and G. H. Coulson, all of 5, Grove Street, Wantage, Berks.

Gay Bowers Fruit Farm, Limited. (490319.) Manor Farm, Gay Bowers, Danbury, Essex. Nom. cap.: £10,000 in £1 shares. Permt. dirs.: D. M. Lambert and Mrs. E. U. Lambert, Manor Farm, Gay Bowers, Danbury, Essex.

T. J. Coulson, Limited. (490360.) The Bakery, High Street, Welwyn, Herts. To carry on business of bakers, pastrycooks, flour millers, etc. Nom. cap.: £2,000 in £1 shares. Permt. dirs.: T. J. Coulson, The Bakery, High Street, Welwyn, Herts; P. B. Coulson, North Street, Welwyn, Herts.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.